CHRYSANTHEMUMS

A. G. Roehr. 40

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CHRYSANTHEMUMS

AND HOW TO GROW THEM

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THE CHRYSANTHEMUM IS INDEED A GARDEN FLOWER

The greatest rewards and successes, in terms of results and true enjoyment with the least expense and trouble, are often achieved by the amateur who grows the hardy, many-flowered garden varieties

Chrysanthemums
And How to Grow Them

As Garden Plants for Outdoor Bloom
and for Cut Flowers Under Glass

BY
I. L. POWELL

ILLUSTRATED

GARDEN CITY NEW YORK
DOUBLEDAY, PAGE & COMPANY
1913

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CHRYSANTHEMUMS

AND HOW TO GROW THEM

CHRYSANTHEMUMS

CHAPTER I

Points for the Beginner

Obtaining information and planning the work — Care of stock plants — Simplest methods of growing — An amateur's experience

Naturally the very first question that the would-be grower of chrysanthemums asks himself is: "When shall I begin?" Begin right now, whether "now" happens to be June or January. While certain parts of the year are, of course, more favourable than others for doing practical work in connection with the growing of chrysanthemums, there is no time when something may not be done toward making a start.

The commencement of the expert chrysanthemum grower's year is about the first of October. It is then that he begins to see the results of his past year's work, and, in consequence, is able to set about intelli-

gently making plans and preparations for the ensuing year. It will be well to watch this expert, and, so far as possible, adopt his methods. His note-book will be a prominent factor in his operations at all times, and particularly so at the beginning of the chrysanthemum year. As his flowers come along he jots down the date of full development, the condition and appearance of blooms from the different kinds of buds, and whether colour, form, and general character are desirable. He decides which varieties and how many of each he will grow, and selects the healthiest plants that have produced the best blooms for "stock" plants for propagating purposes. As soon as the blooms are cut he has these stock plants stored in some cool, light, and well-ventilated place, convenient for watering. A sheltered and well-protected coldframe, he finds a most excellent place for storing stock plants from which cuttings are not to be taken before February 1st. When cuttings are required as early as January 1st he places them in a greenhouse where a temperature of 45 to 60 degrees Fahr. can be maintained. Meanwhile the expert

grower will have visited some of the prominent chrysanthemum exhibitions, noting what new varieties appear to be improvements, also which of the older varieties are shown in good condition. He will probably also visit other experts at their places of business and endeavour, in a fair and friendly way, to learn what new or improved varieties, or methods of cultivation, they may have. Labelling will be observed, and all names that are doubtful verified or corrected. Memoranda will be made of all desirable varieties that he sees and lacks, and such varieties will be procured at the proper time.

SIMPLEST METHOD

Having got these necessary preparations of the expert clearly in his mind, the beginner must consider the structure in which he is to grow his plants, and the method of culture that he desires to adopt; for of the various methods there is sure to be one that can be made available for his needs and convenience. The easiest and simplest method is, of course, that of growing the plants out of doors with but little,

if any, protection. For this purpose the small-flowered, hardy varieties known as "pompons" generally, and in some sections of the country as "artemisias," are used. Apart from the fact that they are the cheapest and most easily grown of all the different types, they are so very desirable for decorative garden effects that they are used extensively on the large country estates. They are deservedly popular, for they give a display of bright and pleasing colour when practically every other outdoor flower has been destroyed by frost. While protection is not necessary for them at any time, the season of bloom will be lengthened by having them planted where a building or trees will form a windbreak.

The next simplest method is to plant some of the early varieties of the large-flowered type out of doors in a well-sheltered position, and then drive strong stakes in the ground about them to support some protecting material — burlap, matting, canvas, muslin, heavy building paper, or any old covering that is available. Or, better still, but a little more expensive, arrange

BUDS AND DISBUDDING — I

The best combination of color, form and quality is generally produced by a terminal bud, but crown buds give larger (and fewer) blooms. For best results remove the first crown bud (5A) and develop the flower from the second (5B). For other figure references see Plate III

BUDS AND DISBUDDING — II

Figs. 1, 2 and 3, terminal buds, the last after disbudding; Figs. 4, 5 and 6, crown buds, the last two showing how to develop the second bud (5), and methods of pinching; Fig. 7, pinching to develop terminal buds, and Fig. 8, the result; Figs. 9, and 10, the effect of disbudding is to produce more, smaller blooms. (See pages 9, 10 and 11)

a rough frame about them and put a few sash of glass over them during cold weather.

AN AMATEUR'S EXPERIENCE

As illustrative of what may be done with such outdoor treatment of early varieties, the experience of one amateur, told in his own words, is uncommonly interesting:

"Great was my satisfaction in demonstrating that the early varieties of the large-flowered type of chrysanthemums could be successfully grown out of doors. I prefer to have my plants in the open border, where they lend their beauty to the general scheme of the garden. I have no greenhouse and I do not want one.

"Planting out is done the latter half of April, either from division of the old roots that have been wintered outdoors, or from new plants that I buy from the florists, as I try a few novelties each year.

"Division of the old plants and roots and replanting each spring are a necessary detail if you want flowers of size and quality. Plants that have wintered in the open ground are dug up as soon as they have made new growth of two or three inches. They

are carefully broken into separate pieces, taking some roots with each sprout, if possible. I find that this gives the plant an earlier start, which makes it much stronger.

"As chrysanthemums are what gardeners call 'gross feeders,' the ground is made very rich by spading in an abundance of old manure. The bed in which they are planted is raised slightly above the general level of the garden, to secure good drainage, and all through the season I am careful to keep plenty of free space around the plants, so that they are open to both light and air, which results in a healthy, sturdy growth, that counts for much when the flowering time comes.

"If I want to grow the plants to a single bloom, one foot apart is ample space to allow when planting. If they are to be allowed to make four or five stems they will need at least eighteen inches. If the plants are to be pinched back several times, allow two feet each way, to allow them to make large plants.

THE ART OF DISBUDDING

"To grow large flowers in my back yard I must follow the methods of the professional florists so far as disbudding and staking the

plants is concerned. It means considerable work and close attention all the season, but when October comes, and the plants are in bloom, I feel that I am well repaid.

"The largest flowers are grown on plants that are allowed to develop but one stem, and only one bud on that stem. All side shoots are removed as soon as they appear, in order to throw the entire strength into the one flower. The art of chrysanthemum growing centres in a knowledge of the different flower buds and their qualities. A reference to the accompanying illustrations will make this plainer. The plant produces two kinds of buds, 'crown' and 'terminal.' The crown is a solitary bud, and the first to appear, forming on the top of the stem before the branches start (Plate II, Figs. 4 and 6). Terminal buds come in clusters at the ends of the final branches which the plant sends out, and terminate the season's growth (Plates II and III, Figs. 1, 2, and 10).

CROWN BUDS FOR LARGEST FLOWERS

"When growing for an individual flower of the largest size, a crown bud is generally selected, and all side shoots are nipped off

as they start (Plate III, Fig. 6). The first crown bud, although capable of producing an immense flower, is often deficient in colouring matter, and otherwise lacking in the essentials of a perfect flower. Therefore what is called the 'second crown' is generally chosen as being more certain to give satisfaction. It requires expert knowledge to decide on the propriety of using the first crown, but for the amateur it is much better to rely on the second.

"This is obtained by pinching out the tip of the stem (Plate II, Fig. 5-A) in June, or when the stem is eight or ten inches high, before the first crown has appeared, and then allowing a shoot (Plate II, Fig. 5-B) to grow from the base, or axil, of one of the leaves, just below the top. This in turn is kept free from branches in the manner shown in Plate III, Fig. 6, and develops a single bud, which produces the desired quality, and flowers four inches across.

"By thus removing the tip, without waiting for the first crown to form, one saves time, and, what is very important, is likely to secure a stouter growth. Should the branch (Plate II, Fig. 5-B) end in a cluster

A HARDY CHRYSANTHEMUM BORDER

The chrysanthemum is the flower for every one. Contrary to ideas derived from exhibitions and florists' windows, it is not necessary to devote a greenhouse, great areas and countless hours of detailed care to its growth

THE ARTISTIC APPEAL

The chrysanthemum possesses an intrinsic, artistic beauty approached in no other flower. Few people have appreciated its decorative value as have the Japanese

of buds, nip out all but one, leaving the strongest, which is generally at the top.

MORE FLOWERS FROM TERMINAL BUDS

"I prefer to grow the terminals, and three to a stem. Although the flowers are not so large, they are more graceful, both in the garden and when cut. When the young plant is about five inches high nip off the top (Plate III, Fig. 7). Shoots then start from base of the leaves, forming a plant with three to five branches (Plate III, Fig. 8). Each of these stems will probably terminate in cluster of buds (Plate II, Fig. 2), which is disbudded as necessary at the stage shown in Plate II, Fig. 1. I leave three good buds, well separated, which will develop as shown in Plate II, Fig. 3.

"These clusters could be reduced to one bud to a stem for larger flowers, or allowed to develop naturally into a number of flowers (Plate III, Fig. 10). The latter, however, are too crowded to give perfect blooms.

MAKING A BUSH PLANT

"For a bush plant, start with one the size of Plate III, Fig. 7; pinch out the tip,

and, when each branch is five inches long, and looks about the same as the original did, pinch out the top of each shoot, and in turn treat their branches similarly. When the clusters of terminal buds appear remove all but the centre bud, if you want the finest flowers. The more buds you leave the smaller the individual flowers.

TRAINING FOR STANDARDS

"I like to grow a few plants in tree or standard form, just for variety. I start as for single-stem plants, and, when the stem is about three feet high, nip out the top. This induces branching, but only the upper five or six branches are retained, all the others being rubbed off. The subsequent treatment is as for bush plants. They need careful staking.

"Unfortunately, the plants which are destined to grow large flowers will not stand alone. One stake to a plant is generally enough when growing but a few stems to a plant, but when more are required they become quite unsightly. Galvanized steel wire can be used, and is less obtrusive. If several plants are growing together, drive

a five-foot stake at each end of the row, and connect them by wires placed a foot apart, to which the stems are tied as they grow.

"An invisible support of my own devising is perhaps the best of all when growing a clump or bush. As the plant increases in size drive a heavy stake (a broomstick painted green) so the top will be in the centre of the clump, the bottom sometimes slanting out slightly, to avoid the roots as much as possible. From this, suspend by four strings a heavy wire ring about eighteen inches in diameter, and with hooked ends, to allow its being joined around the plant and brought up from below. The strings are tied to the ring in slip knots, to permit of the ring being raised or lowered as the plant may require. The plants completely hide the stake, which can be driven quite low, and the method of support is not noticed.

"Aside from the staking and disbudding details, the routine of work is simple. See that the plants do not want for water, and early in July spread a mulch of about two inches of old manure about the roots to prevent the ground from baking. From

July until the buds begin to show colour I water once a week with liquid sheep manure, which is made by soaking five pounds of sheep manure in forty-five gallons of water, often and weak, rather than seldom and strong, being my guiding principle in the feeding of the plants. The black and green aphides are always troublesome, but they can be held in check by the frequent use of tobacco dust.

PROTECTION FROM EARLY FROST

"Though the plants themselves are hardy, the flowers of the large-flowered chrysanthemums are more or less tender, and must be shielded from frost. About the middle of September six-foot stakes, six feet apart, are driven into the bed parallel with, and two feet from, the edge. The stakes are connected by a wire fastened well above the tops of the plants. Over the frame thus formed strips of burlap, long enough to rest on the grass in front and extend well down on the other side of the wire fence at the back of the bed, are thrown whenever frost threatens. The strips are weighted at each end with a stick. Other material,

such as muslin or canvas, would answer as a cover, but the burlap is both tougher and cheaper, the cover used last fall being good after several seasons' wear.

WINTER PROTECTION

"After the flowers have matured or have been cut, the old stems are cut off close to the ground and the stools covered with about eight inches of loose, strawy material. Leaves alone prove too compact. I understand that some people prefer to dig up the roots and store the balls of earth close together in a corner of the cellar, where it is cool but not freezing, but I have never done so. Indeed, the old roots are not disturbed until the spring division, and they have done very well with me out of doors."

The methods adopted and the results obtained by this amateur are above criticism. An expert could scarcely do better. A list of varieties recommended by him as being well adapted to his method of treatment will be found in the chapter devoted to "types and varieties." In reference to wintering the plants out of doors, it is doubtful if equally satisfactory results will be

obtained in all localities and soils. In colder localities and heavy clay soils the plants would be more liable to perish. Some pieces of boards laid over the litter to keep the plants dry would make them practically safe anywhere.

CHAPTER II

Growing Under Glass

The best kind of house — The other kind — Makeshifts — Utilizing houses used for growing other plants — Arrangement of houses for growing specimen cut blooms for exhibition or market — For specimen bush plants, market plants, and for general decorative purposes — Storage room

When chrysanthemums are to be grown in considerable quantities, and with the expectation of producing the best grades of blooms, whether for pleasure or profit, there is but one really satisfactory way to do it, and that is in a suitable greenhouse. While simple and inexpensive methods of construction will be described to enable many people of modest desires to produce good blooms and enjoy them, a well-constructed greenhouse is necessary for flowers of the highest quality.

CONSTRUCTION OF THE HOUSES

Greenhouse construction has reached a very high state of development at the present time. Architecture, material, and

workmanship are of the highest quality. Iron and steel framework is largely used by the best builders and generally accepted by their customers. While comparatively few houses are used for chrysanthemums the entire year, there are a great many houses built for the express purpose of growing them. Various forms are used with equally good results, but one of the best is the even-span house. This may extend either east and west or north and south. Ventilators should be provided for both sides, at the ridge, and below the eave-plate. The chrysanthemum is a robust species of plant and delights in an abundance of pure air, freely circulating. A house 25 to 30 feet wide, 15 to 16 feet high at the ridge and 5 feet high at the eaves, of such length as may be desired, will be found to be of desirable proportions, although the present tendency is to build considerably larger houses when plants are to be grown in large quantities.

INFLUENCE OF HOUSE ON PLANTS

That the character of the house has a decided influence upon the plants may

A HOUSE FOR CHRYSANTHEMUMS AND CARNATIONS

The latter are grown in the outside benches. The former need the extra head-room afforded in the centre of the house. Note the arrangements for shading

PRIZE EXHIBITION BLOOMS IN THE BENCH

Plants grown as thickly as this require heavy feeding, protection from insects and disease, and plenty of support. The variety is Timothy Eaton

be gathered from this statement by S. A. Hill in *The Florists' Exchange:*

"With most florists who grow roses, carnations, and chrysanthemums, first place and the choicest position is always given the rose; the second best is given the carnation; while the chrysanthemum is relegated to 'any old place,' only provided that there is tolerably fair head-room for it. It is only of late years, and with the most ambitious exhibitors, that the chrysanthemum has received much consideration as to her blooming quarters; but as the old style greenhouse passes, and new, up-to-date structures replace it, the chrysanthemum will be found growing in high, broad houses, where the pure air is in free circulation, carrying life and vigour into every leaf. Two of our 400-foot houses are 18 feet high on the ridge, and we have several times reconsidered and decided that they probably contain a good many cubic feet of wasted space; but this year in a re-arrangement of stock with the new place they somehow got planted to chrysanthemums, with an apology to ourselves for giving up such valuable space to this tribe from the East,

who are supposed to care little where their tents may be pitched, if only the man with the knife will make no mistake in selecting their buds. But — on tile benches, with plenty of room overhead, and free air coursing in every direction — these chrysanthemums have developed heavier stems and more perfect foliage than we have ever before seen on our place, and we feel sure that the big houses are largely responsible."

PROPER HOUSES IMPORTANT

Old houses with heavy sash bars, small glass, little head-room, and 2 x 4 foot ventilating sash, ten feet apart, will not produce first-class blooms, however well the plants may be treated otherwise. Leaf spot, mildew, and other diseases will be almost certain to attack the plants growing under such conditions. Cheap houses may be built that will produce good blooms, if the plants are treated properly, but they must be light and well ventilated.

I have grown good plants in a temporarily constructed house made by setting two or three rows of posts, to the tops of which strips of narrow boards were nailed hori-

zontally and hotbed sash placed on them with battens over the joints. With two rows of posts a shed roof can be formed, and with three rows an equal span will be made. No sides will be needed until cold nights come; then boards, shutters, or other material can be placed about the sides. Mosquito netting may have to be placed about the sides in some localities to prevent the depredations of the tarnished plant bug.

The plants may be grown in houses that are devoted to other things for a portion of the year. An early peach house or vinery may be utilized after the crop of fruit has been removed, although here again light will be more or less obstructed, and first-class results are not likely to be obtained. They may often be grown in houses that are to be used during the winter for such vegetables as tomatoes or cauliflower, without interfering seriously with those crops.

BENCHES BETTER THAN SOLID BEDS

When it is intended to grow large specimen blooms, the house may be arranged with solid beds, made of good soil placed upon the earth floor, or with benches of

wood, cement, or other material. Benches made to hold soil to a depth of four to six inches, with openings in the bottom — evenly apportioned to each square foot of its area and amounting to from five to ten per cent. of the area — for drainage are better than solid beds, as the grower has greater control over the roots. Plants in solid beds will often make stronger growth and heavier foliage, but the flowers will not generally be as good.

Benches should be low, particularly so those at the sides of the house, allowing at least three feet from top of bench to eave-plate. Anywhere from twenty to thirty inches will be a convenient height. Benches may be constructed resting directly upon the earth floor, if proper drainage can be provided, various methods of construction being used. Benches can thus be made practically indestructible, and to combine the advantages of benches with all the available head-room secured by using solid beds. For convenience in working, the beds should be not more than three or six feet wide, those of the latter dimension being between two walks. Walks may be from

twenty to thirty-six inches wide. One walk through each house should be not less than thirty inches wide, to allow room for carrying soil, cutting blooms, and visitors to pass. Other walks may be as narrow as twenty inches. Walks and beds, of course, must conform to the dimensions of the house.

For growing large specimen bush plants a house without benches is best, although the plants will be better for being placed on benches reasonably close to the glass while in their smaller state. After they have had their final potting they will be benefited and be more convenient for working if placed directly on coarse gravel or bricks on the earth floor. This arrangement is also good for ordinary plants that are being grown for decorative purposes. In growing pot plants for market, benches will be better, as the plants will not be too large to be handled easily and they will be more convenient for giving general care. For growing cut blooms for market, benches are best. If to be grown in large quantities, it is better to have sections or divisions of houses for lots of early, mid-season, and late varieties,

so that each lot may receive treatment according to its needs.

Where plants or blooms are grown for exhibition, or where for any other reason it becomes necessary to keep them for some time after they have matured, as is frequently the case, a storage room is desirable, and if not available should be provided. Blooms are soon ruined if left in the house where grown. A dry, well-ventilated building or shed where there is from six to ten feet of head-room, where a temperature of from 35 to 45 degrees may be maintained, and where bright sunshine or even strong light can be excluded, will be an ideal place for the purpose.

CHAPTER III

Preparing the Soil and Propagating

Character of soil — Manure — Composting — Condition of soil used — Getting stock plants in condition for taking cuttings — Arrangements for propagating — The north-side propagating house — Cuttings in boxes or pots — Division of old plants — Propagating for specimen bush plants and standards — For cut blooms and small pot plants — Grafting

One of the most important operations connected with the growing of good chrysanthemums, either large plants or fine blooms, is that of procuring and preparing the proper soil for them. If possible, this should be done the autumn previous to the season when it will be required. Otherwise it must be prepared as early in the spring as possible.

MECHANICAL CHARACTER OF THE SOIL

The mechanical character, or texture, of the soil is of greater importance than its chemical character or fertility. The chemical elements required by the plants can be supplied after the plants have been

planted and are growing. If the soil is not in good mechanical condition before the plants have begun to take root nothing can be done to improve it without injury to the plants. If the mechanical character of the soil intended for use is bad, some means should be used to improve it; for while plants may be successfully grown in soils varying considerably in this respect, extremes of any kind are sure to prove detrimental to the health of the plants. The soil generally conceded to be best for growing chrysanthemums is a friable clay loam. Stiff, heavy clay, muck, sandy or gravelly soils are not good for the purpose, and when from necessity any of them must be used, efforts should be made to improve them by the addition of other materials or soils of opposite character. Heavy clay soil will be improved by the addition of about one sixth each of sand and leaf mould to four sixths of the clay. Gravelly and sandy soils will be improved, both mechanically and chemically, by having a greater proportion of heavy manure added to the compost than soils of heavier texture can stand.

In collecting the soil, that taken from the surface of a pasture field, by removing about three or four inches, is most desirable. This should be placed in a layer about six inches thick, in some convenient place, and the layer of such extent as to make about one fourth of the entire quantity required. Upon this place a layer of good manure, preferably cow manure, although horse, hog, and sheep manure are all good, if well decomposed. Sheep manure is generally the richest of all. Fresh cow manure may be used, but old is preferable. The layer of manure should be about two inches thick, equal to one fourth of the entire bulk. Add another layer of soil and manure and continue until the heap is from two to three feet thick. If prepared in the fall, it should remain undisturbed until the frost is out of it in the spring, when it should be turned, beginning at one end or side, chopping the heap down with a spade or other implement, mixing the soil and manure well together, and making the heap somewhat broader than before. Allow it to remain in this condition for two or three weeks. Then spread over the top and sides a coat-

ing of good ground bone, equal to one half peck to each cubic yard of compost, chop the heap down, and turn and mix thoroughly as before. Generally this will put the compost in good condition for use, although if the soil is stiff and rough a third turning may be beneficial. When the compost is not prepared until spring it should be turned as soon as collected, and a third turning will most likely be needed. Such a compost, if properly prepared, is all that is required for general pottings and for filling boxes or benches.

AN EXPERT'S OPINION OF COMPOST

The fact that chrysanthemum growers generally the world over are well agreed upon the character of compost to be used for successful results is plainly shown by the following expression of opinion upon the subject from the writings of an English expert:

"The question of the feeding of the chrysanthemum resolves itself into two parts—namely, the nature of the compost and of the subsequent feeding which is given when the flower buds appear. It is com-

monly held that the basis of the compost should consist of good fibrous loam. The physical (mechanical) condition of the soil is of almost as much moment as its chemical constitution. It is of prime importance that the soil shall be porous, in order that thorough drainage and aeration be obtained. For this purpose it is well to mix with the soil a certain amount of sharp sand and charcoal, the presence of the latter being particularly desirable. The nature of the soil, too, governs the manner of potting. For a sturdy growth, light soil should be firmly packed, while heavier soils require only loose packing. The use of heavy clay loam brings with it the danger of water-logged roots, while a very light, sandy soil permits excessive drainage and consequent root starvation. It is preferable, however, to err on the side of lightness rather than heaviness. With the loam, well-rotted stable manure may be mixed in various proportions, although the ratio of one part manure to three parts loam will probably give the best results. Horse, cow, and sheep manure can all be used with good results; but cow manure is generally preferred, as

it gives up its fertilizing qualities gradually. It is often advantageous to add to the compost one part in four of leaf mould. With the lighter soils this is particularly desirable, not so much because of any addition of nutrient material, but because of its power of retaining water and plant food.

"Various animal as well as mineral fertilizers have frequently been added to the compost, and sometimes even used as substitutes for the stable manure. Guano has thus been used with good results; so have fish manure and dried blood. A very good practice is to add to every cubic yard (twenty bushels) of compost forty pounds of finely ground bone manure, which not only serves as a source of phosphoric acid and lime, but furnishes some nitrogen. Soot also has with advantage been made a part of the compost. This furnishes as much as 3 per cent. of nitrogen, chiefly as sulphate of ammonia, as well as small quantities of phosphoric acid and potash. It may be used at the rate of one to five pounds to 100 pounds of compost. Should the loam be at all deficient in lime, the deficiency should be corrected by the addition of a few hand-

Shoots, from which root cuttings are made, about the base of a stock plant

Cuttings as taken, and, after being trimmed, ready to be set away in sand to root

The cutting has struck root in sand and is ready for potting in good soil.

Thrifty cuttings after several weeks in pots. Note the well-developed root system.

ROOT CUTTINGS — II

fuls of slaked lime — two or three pounds per cubic yard of soil. A lack of lime will cause soft stems and flabby leaves.

"Nitrate of soda and sulphate of ammonia have been recommended by some growers as a part of the compost. The evidence in favour of this practice is at present insufficient to commend it. It seems an unnecessary addition, with danger of a too concentrated soil composition, and waste of nitrogen through rapid drainage. Excessive concentration of nutrients in the soil mixture is more injurious than a deficiency, because of the inability of the roots to absorb solutions above a certain degree of concentration. The result is that the plant starves. This fact has been very strikingly shown by some chrysanthemum cultures seen by the writer. Again, in the presence of an excess of nutrients, a good development of roots is not produced, even though the concentration of the soil solution is not too great for absorption by the roots; and, further, the roots are not in condition to take up the subsequently applied liquid manure. The best plan is to have a moderately rich compost, thereby obtaining healthy

roots, stems, and leaves; then, when the buds appear, apply the rich liquid manures. Experiments have shown that nitrate of soda and sulphate of ammonia may be used as a substitute for stable manure, although not as an addition to it. Still this does not at present seem advisable, the better plan being to reserve these for the subsequent feeding as liquid fertilizers." — J. J. Willis, in *The Gardener's Chronicle.*

STOCK PLANTS

To insure healthy cuttings, the stock plants must be given such treatment for three or four weeks previous to the time that the cuttings are required as will induce vigorous, healthy growth. The condition most conducive to this result is a light, well-ventilated greenhouse or frame, where the temperature may be kept at from 40 to 50 degrees at night and from 50 to 60 degrees during bright, sunny days. Stock plants that are given such treatment as soon as the flowers are cut will furnish good cuttings by the middle of December. When cuttings are not required until January or February or later, the stock plants may be kept as

described in Chapter I, and be brought into growing condition as desired.

PROPAGATION

The methods required for successful propagation will vary slightly during the season, according to the changing character of that period, but the essential principles are the same throughout. These principles are: Pure, clean atmosphere, without draughts of air striking the cuttings until they have begun to make roots; considerable moisture in the atmosphere; temperature as nearly as possible between 45 and 55 degrees; and some arrangement that will hold clean, sharp sand, fine gravel, crushed stone or brick, or even washed coal ashes, to a depth of two to three inches. Various arrangements may be made to provide these conditions according to the quantity of plants to be propagated, the facilities available for the purpose, or the inclination of the operator, from the extensive propagating houses of the prominent commercial establishments to a few pots, a small box, or a saucer in the window of some enthusiastic amateur. The best methods of doing this

work are those adopted by the large commercial establishments. There a large bench in a house, or perhaps an entire house, will be devoted to the purpose. Cuttings that are propagated before the first of April will do well in a good position in any house if well shaded. After that date what is known as a north-side propagating house is more desirable for the purpose. This house is made by practically putting a partition lengthwise of an even-span greenhouse that extends east and west, thus forming a low, narrow house at the north side of a three-quarter span house. Architecturally the propagating house may be distinct from the other. It is generally from six to seven feet wide, with a bench three to four feet wide. The most of the heating pipes are placed under the bench, the sides of which extend below the bottom, sometimes to the floor, thus forming an enclosure for the pipes and maintaining a higher temperature under the cuttings than that of the atmosphere above them, producing what is termed "bottom" heat. Cuttings of most genera of plants root more quickly, and often better, for having a

limited amount of bottom heat, and the chrysanthemum is not an exception. It should be very slight, however, 60 degrees being the highest temperature allowable.

Cuttings in small quantities may be rooted readily in boxes, seed pans, or flower pots. I have made an excellent propagating frame from a large box about ten inches deep, with openings in the bottom for drainage, covering it with moss and putting in three inches of sand. When the cuttings were inserted the box was covered with glass, which could be removed entirely or raised for ventilation, as required. For propagating after April 1st, the coolest position that is available should be chosen and some means used to protect the cuttings as far as possible from direct draughts of air, which must necessarily be admitted at this season. The outside temperature is very much higher at this time, the sunlight strong, and the cuttings are likely to suffer from too rapid evaporation of the moisture which they contain, and which they have practically no means of obtaining until roots are formed. Such conditions tend to

weaken and harden the cuttings, and, if not mitigated as far as possible, will seriously damage them. The house should be shaded lightly and some material placed directly over the cuttings. Newspapers answer the purpose fairly well; in fact, they are excellent if they can be kept in place. Plant-protecting cloth or cheese cloth, placed a few inches above the cuttings and kept moist, is good. Abundance of moisture must be supplied the cuttings at this season; they should be watered several times during the day, if the sun is shining. The bench, walls, and walks should also be frequently sprayed with cool water.

The method of propagation used in England is to fill small pots — 3 or 4 inch — with a mixture of one third each of sand, leaf mould, and soil; then cuttings are inserted near the edge and the pots placed in some position where the necessary conditions may be maintained. That method is but little practised in this country. It might, however, be adopted by amateurs who desire to grow only a few plants.

Clean, sharp sand is the best material for rooting the cuttings, but where this is

not available excellent substitutes will be found in fine crushed stone or brick, and washed coal ashes.

MAKING THE CUTTINGS

As before stated, cuttings should be taken from healthy plants only. The young shoots that are to be used should be reasonably strong and of good colour. They should be cut about three inches long, and, as they are detached from the plants, tied in bundles, with a label for each, and placed in water immediately. A good cutting should be from two to three inches long, being the top of a growing shoot. This should be cut clean with a sharp knife and one or two of the lower leaves removed, the ends of the upper leaves being cut off. By taking the cutting between the fingers of one hand and bringing these leaves together at the tip of the cutting, they may all be clipped at once, and with a little practice the work of making the cuttings properly can be done very rapidly. For the best results the stem of the cutting should be reasonably soft at the base. If too hard it will not root so readily, although where it is desired to

get as many plants as possible of a variety, as in the case of a new or scarce one, cuttings may be made of the entire shoot, using a single eye or joint for each. Should these cuttings be very short, they may be fastened to a toothpick or any small splint, allowing it to extend an inch or more below the base of the cutting, this being pushed into the sand as a support. If not convenient to put the cuttings in the sand as soon as made, they should be left in water, or, if to be kept for any length of time, should be packed in damp moss and put in a cool place.

Before putting the cuttings in the sand the latter should be made firm by pounding the surface smooth and, if dry, watered. A good plan is to have a strip of wood about three inches wide and of the length of the width of the cutting bench. This will serve as a rule to draw the lines for the cuttings. Have a piece of wood shaped like a knife blade, but about one fourth of an inch thick. With this draw a line by the edge of the stick about one and a half inches deep, insert the cuttings, use the edge of the rule to firm the sand by the side of the cuttings,

and repeat. The cuttings, if strong, may be about two inches apart in the rows; if weak, closer. The rows may also be closer than three inches, if it is desired to utilize space to the best advantage. As soon as the cuttings are in the sand they should be given a thorough watering, and must never be allowed to suffer for want of moisture. Cuttings should be well rooted in from two to three weeks, without bottom heat; with it, in from ten to fifteen days. Propagation may also be effected by division of the old plants, or, rather, by carefully removing the young shoots with the roots that have already formed in the soil. This method is rarely practised, but may sometimes be used for getting bush plants or standards started early.

GRAFTING FOR STANDARDS

Grafting the chrysanthemum is but rarely practised, although the operation is not difficult. Whenever it is done it is generally for the novelty of having two or more colours, or varieties, produced by one plant. It has occasionally been done for the purpose

of imparting the strength of a vigorous variety to a weaker one, but there is very little gained in that direction. Standards that could not be obtained in any other way may be formed by grafting.

The best method of procedure for grafting bush or single stem plants is to select some vigorous-growing variety to supply stocks. Propagate the stocks as early as possible, and when they have become well established in their first pots, and have made five to six inches in growth, cut them back to about three inches, split the remaining stem about one inch down, cut the scion wedge shape, insert in the split made in the stem of the stock, and bind the point of juncture firmly but not tightly with raffia or some other soft material. Then place the plants in a position where the temperature can be kept at from 60 to 70 degrees and a close, moist atmosphere maintained, giving only sufficient ventilation to keep the air pure, and shade from bright sunshine. After ten days or two weeks they may be removed to ordinary conditions, still keeping them shaded, and sprayed with water frequently for another week, when they may be grad-

ually exposed to full sunlight and air. If it is desired to graft more than one variety on to one stock, the stocks must be "stopped" when they are about three inches high. (The process of stopping is fully described in Chapter IV). If more than two or three varieties are to be grown on one stock, the stock must be stopped again; as many shoots must be produced as the number of varieties desired. When the shoots from the last stopping have made a growth of six inches, proceed as before described. To graft a standard the stem must be grown to the desired height and then grafted with a single scion, or the stem may be stopped and the resulting branches grafted, as in the process previously described.

A large globe, a bell glass, or even a large fruit jar may be placed over the head of the standard, and supported from below, to produce the conditions of moisture and heat, care being exercised that the matter be not overdone. Some years ago a writer gave an account in one of the English horticultural publications of the wonderful results obtained by grafting the large-

flowered varieties on stocks of *Chrysanthemum frutescens*, commonly known as Paris daisy. I tried the matter out, but the results were not satisfactory.

CHAPTER IV

Bush Plants and Standards

Time for propagating — Watering — Condition of soil used — Drainage — Stopping or pinching — Tying and training — General care — Supports for the blooms — The finishing operation — Transporting the plants

To produce first-class specimen bush plants or standards the grower must use all available means at his command, leaving nothing to chance that possibly can be foreseen. Good large plants are more attractive and impressive than good small ones. To get large plants they must be propagated early. It is advisable to put in at least two lots of cuttings for this purpose; three lots will be better, as "things" will happen to the plants, no matter how well they are managed. Early propagated plants that are intended for large specimens will sometimes make flower buds in March, which generally will ruin them for the purpose intended. The first lot of plants should be propagated before January 1st,

another lot about January 20th, and a third lot about February 15th. If anything happens to either of the early lots the next can be used, and as little time as possible lost. First-class bush plants cannot be grown from plants propagated after March 1st, much less standards. Generally but few plants are needed, and the small amount of space required for the extra plants may well be allowed. By this method the grower is reasonably certain of getting some plants to grow to a successful issue. The plants not needed may be grown for cut flowers, or for simple decorative plants, or be discarded altogether. In selecting varieties for bush plants choose those having a vigorous but rather dwarf habit of growth, moderately heavy foliage, good, strong stem, and a full flower of fine colour. Comparatively few of the many varieties in general cultivation will make good bush plants or standards.

As soon as the cuttings have made roots from one half to one inch long they should be taken from the sand and potted, using a soil composed of three fifths good loam and one fifth each of sand and leaf mould

thoroughly mixed. If leaf mould is not available, old, light manure may be substituted. Two- to three-inch pots may be used, according to the amount of roots the cuttings may have. A little sphagnum moss, with a few pieces of charcoal placed in the bottom of each pot, will provide sufficient drainage for these sizes of pots. The soil should be made firm about the roots, and the plants placed in a position near the glass where they will receive the full benefit of the sunlight, although they must be shaded from it for a few days. The temperature should range from 45 to 50 degrees at night to 60 to 65 during bright days. The plants should be given a thorough watering soon after being potted; afterward water should be applied only when the soil has become fairly dry. If the soil is kept saturated it will become sour and the plants will not thrive. Watering must be done with good judgment at all times, but special care must be exercised in this respect immediately after each repotting until the roots have penetrated the soil freely. When the soil has become filled with roots, no reasonable amount of water will do harm, if the soil

is of proper texture and good drainage has been provided.

WHEN TO REPOT AND SIZES OF POTS TO USE

If proper care is given, the plants will make roots rapidly, and should be repotted as soon as the ball of earth has become fairly well filled with them. Do not at any time allow them to remain in the pots until nothing but a mass of roots can be seen when the plants are turned out of the pots. This condition is what is termed "pot-bound," and will cause the growth to be checked to a greater or less extent. Examine the plants frequently by turning some of them out of the pots. When potting, ample room should be left from the surface of the soil to the top of the pots, for water. This will vary from one half an inch for the smallest pots to two or three inches for the largest size. The soil for potting (or planting) should be in only a moderately moist condition, so that if taken in the hand and pressed firmly it will, when released, retain the imprint of the hand, yet fall apart readily. Such soil is in ideal condition.

In potting, the lighter the soil the more firmly it should be packed. Heavy soils should be packed very little.

THOROUGH DRAINAGE OF THE GREATEST IMPORTANCE

Before repotting, the pots that are to receive the plants should be provided with some material that will allow any excess of water that may be given the plants to pass away freely and quickly. There is nothing better for this purpose than pieces of broken pots. Charcoal, clinkers, or coarse cinders from coal, however, may be used, either in conjunction with the broken pots or alone. One good-sized piece should be laid over the hole in the bottom of the pot, the concave side down, and smaller pieces placed over the large one. A single layer of the small pieces will do for the smaller sizes of pots, but for the largest pots they should be at least one and one half inches deep. A layer of sphagnum over the drainage material for the smaller pots and some rough, fibrous sod for the large ones will be beneficial. Four-inch pots are

generally used for the second potting and are probably better than a larger size for the purpose, although I have had equally good results by using six-inch. More care will need to be exercised in watering when the larger size is used.

This repotting, or "shifting," as it is termed, must be repeated as the plants require, using pots about two inches larger at each repetition, until the plants are in eight-inch pots. From these they should be shifted into the pots in which they are to flower, which may be either ten, twelve, or fourteen-inch. The last is not too large for healthy plants, which should produce from two to three hundred good flowers. After the plants have been potted into pots larger than eight-inch they cannot be repotted with safety, the body of soil being so heavy that it is liable to fall apart, damaging the roots. At the last potting some additional fertilizer may be added to the soil. A quart of bone meal and a shovelful of good manure to each barrow load of the compost prepared for general use will be safe and prove beneficial. The coarser portions of the soil should be selected for this potting.

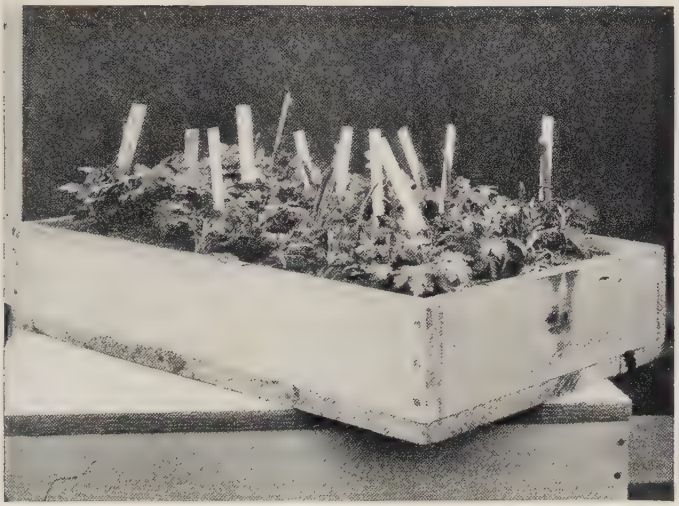
TRAINING THE PLANTS

When the young plants are from two to three inches high they should be "stopped," which means that the point of the growing stem or branch must be removed. This is generally done by pinching it out with the thumb and finger nails, or it may be done with the point of a knife. This will cause the plant to send out branches from below. From three to five will generally start after each stopping. After these branches have made from three to five leaves, according to the position they occupy, they must also be stopped.

At this stage of development, training to secure the desired form of the future plant should begin. There is a great variety of fancy forms in which the plants may readily be trained, but such forms do not find favour in this country. Practically all of the plants grown here are trained in one form, the difference being in degree only. The form mostly used approaches very nearly to a hemisphere, varying more or less to globular or conical. The desired form of the plant should be decided upon and the stopping and tying be directed toward

securing that form. If the summer training is properly done, the plant will have assumed its proper form, but in reduced scale, by the time that stopping should be discontinued, and all that remains to be done after the flowering growths have been made is to tie them in the positions that they are naturally inclined to occupy, no bending or twisting of the shoots or branches being required.

Small stakes may be placed about the plants, and such shoots as are not in the proper position to aid in the symmetrical construction of the intended form may be drawn gradually to the point where needed by placing a piece of soft cord about the shoot, near the point, and tying it to the stakes. This work must be carefully done, as the shoots split very easily at the point of juncture. If the plants grow well, comparatively few of the shoots will require tying, as the stopping, if properly done, will very nearly produce and maintain the proper form. Allow some shoots to grow longer than others to fill vacant spaces, stopping those shorter that are growing away too fast. The natural tendency of the plant is to grow upward, consequently



Stock plants in a flat. Started into growth in the spring, they send up shoots which are taken off as cuttings. (See Plate VIII)

The cuttings have grown into plants in six-inch pots, have been pinched back and will soon be repotted and allowed to develop two flowers each

FALL PROTECTION FOR HALF-HARDY SORTS

Many varieties withstand early frost. Others, at the height of their beauty, deserve some shelter after September 15. Burlap, heavy paper, or the shelter of a building or fence is usually sufficient

the shoots that start from the upper parts of the plants should be stopped shorter than those starting from the sides. It may also be desirable to tie down some of the stronger shoots that develop at the top. This stopping and tying should be continued until about the last week in June or the first week in July. Some growers continue the stopping much later than this, but if the plants were propagated early they should be as large as desirable before making their flowering shoots at the time stated. More stopping will naturally make more flowers, but they will not be so large, the foliage will be smaller, and the general effect will not be so good. When stopping is discontinued before July 1st many of the growths made after that date will produce four- to five-inch blooms, even though the plant is carrying from two to three hundred of them.

The treatment for standards is exactly the same as for bush plants, except that, instead of stopping the plants at two to four inches high, the stem is allowed to grow to whatever height the standard is intended to be. Then the stem is stopped and the body of the plant, or "head," is

formed by subsequent stopping and tying. A strong stake must be set beside the stem of the standard and the stem tied to it.

PREVENT THE PLANTS FROM BREAKING

As soon as the summer training is discontinued, place four or five stakes closely about the plants and run some cord around them, tying it to the stakes in such manner that it will relieve any weight that may fall upon the branches. The plants are very easily broken at this time, and the loss of a branch will ruin a plant.

After the plants have been in their flowering pots long enough to have fairly well filled the soil with roots, it is a good practice to arrange the pots so that some material may be placed about them to protect them from the sun and heat. During the hot, drying days of August and September, when the soil in the pots is completely filled with roots and the sun striking on the pots causes the soil near the outside of the pots to dry out very rapidly, the main body of soil will remain sufficiently moist, but the roots at the outside of the pots will suffer. Boards placed about them will afford shade

and prevent too rapid drying, or some straw or litter may be used. This treatment, as also the following, while not absolutely necessary, will prove beneficial during the periods of excessively hot weather, when every available means should be taken to improve the conditions. The chrysanthemum grows best in a temperature ranging from 45 to 75 degrees, and when the temperature rises into the nineties, as it frequently does, with a dry atmosphere and burning sunshine, anything that can conveniently be done to alleviate such conditions will prove beneficial.

SHADING

The chrysanthemum thrives best in bright sunshine generally, and whatever shade is in any sense permanent in character is detrimental to its best development and is not to be tolerated. Even temporary shade is not absolutely necessary, and, unless used with good judgment, will be better done without. If the matter is thoroughly understood, temporary shade may be afforded to bush plants during the hottest part of excessively hot days during July and August

with beneficial results. Under no other circumstances must shading be considered. Cheese cloth stretched above the plants, either inside or outside the glass, for three or four hours during the hottest part of days when the thermometer reads 90 degrees or more in the shade, will afford the plants all the protection that they should have.

DISBUDDING

With good treatment and favourable conditions during the earlier part of the season, the plants should arrive at the final period of their development — the formation of buds and production of flowers — in vigorous health and with at least two hundred strong, flowering shoots, varying from eighteen to thirty inches in length. About September 1st these shoots will begin to form buds, generally a cluster at the extremity of each shoot and several below in the axils of the leaves. To obtain the best results, all of these, except one at the extremity of each shoot, must be removed. This operation is termed "taking" the bud and "disbudding," and is described in full detail

in the chapter devoted to "growing exhibition blooms." It is only necessary to understand that the same operations are to be performed on the bush plants, the sole difference being that their flowering shoots are smaller than the stems of the plants grown for specimen blooms.

TYING THE BLOOMS IN POSITION

When the plants have been disbudded, preparations should be made for getting the blooms tied in the positions that they must occupy in order to make a symmetrical plant. Some means must be used to support the blooms in their positions. There are two methods of accomplishing this. Both are excellent if well done and either of them may be used with good results under varying conditions. One method is to use stakes of either wood, bamboo, or galvanized wire, the latter being much the neatest of all. One stake is placed to each flowering shoot and the latter tied to it in such manner as will hold the bloom in the desired position. If a plant is misshapen, and bending and twisting the branches must be resorted to in order to get it in shape, this will probably

be the best method to use. The other method, and the one that is more generally used at the present time for the plants, is to make a wire frame about the plant, tying the blooms to the frame or to strings carried from one part of it to another. If properly arranged, and if good judgment is used in tying the blooms, the operator can produce a finished plant that will be symmetrical in form and outline, without the slightest trace of stiffness.

There are slight modifications of the form of the frame that the ingenuity of the operator will suggest, but the following is the general plan of construction: Use six iron stakes of such size and length as the plants will require. No. 8 galvanized wire makes good stakes for plants that will tie out to about three to four feet in diameter; larger plants should have stakes two and one half to three and one half feet long, made from quarter or five sixteenths inch iron rods. If a loop is made at the top it will be found convenient. For plants that will measure, when tied out, seven to eight feet in diameter, use stakes three and one half feet long. Place one in the

centre of the pot and drive it firmly into the soil. Next divide the circumference of the pot rim into five equal parts, place a stake at the point of each division, and drive it firmly into the soil. Wire each stake to the pot by means of pieces of light wire wound about it and drawn to a heavy wire put around the pot under the rim. Next take a piece of No. 12 or No. 14 wire and tie it to the outer end of each stake, thus forming a circle about the plant. The stakes should be placed at such an angle as will give room for tying the greater part of the blooms above the circle; it is better to have some tied below it. The judgment of the operator alone can determine the question of the proper angle to give the stakes. They can easily be bent lower or higher after the circle of wire is in place if it is desirable to do so. Then take some short pieces of the same size wire that was used for the circle and fasten one end in the loop, if you have one, of the centre stake, bringing the other to the upper end of each of the side stakes and secure it by tying. Also run a piece of the wire from the centre stake to the circle, midway between each two side stakes, mak-

ing ten wires in all. You have thus made a frame like that of an umbrella having ten divisions. If the work has been well done two men can take hold of the frame and carry the plant by it.

When you are ready to begin tying the blooms, count the number of them on the plant, divide the number by ten, and the quotient will be the number of blooms to be allotted to each division. This dividing and allotting would better be done before the short wires are tied in place at the lower end. Then they may be raised to allow the blooms to be passed from one division to another, as undoubtedly some will contain more than the required number and others less. This work well done, the plant is ready for tying the blooms in position. The tying can be done at any time after the buds have formed, but it is better to defer doing it until the blooms are nearly half open, as the size and character of the bloom can then be determined, and a much better finish given to the plant. Begin at the centre of the plant and work outward and consequently downward. The blooms will, in all probability, vary considerably in size

and length of stem. In tying, place blooms of different size and height adjoining, as far as possible. If this point is carefully carried out, the plant will be symmetrical in outline and yet free from the slightest appearance of stiffness. Good taste and judgment are very important factors in the successful outcome of this work. Silkoline or green smilax twine should be used for tying. Pieces of this may be stretched from each of the short wires to the other, and blooms that have to be tied between two wires may be fastened to the strings. Each section should be tied in conjunction with the others, working from the centre of the plant and entirely around it until finished. The finished plant should show practically none of the framework.

The frame for tying out the blooms of standards is very similar, except that the centre stake should be made of wood about one inch square. Two holes should be bored through this at right angles to each other, with a gimlet or small bit, just large enough to allow a piece of No. 8 wire to pass through, and at such height as will

allow the circle of wire that is to be fastened to the ends of the two wires to come in proper position for tying the blooms. These two wires correspond to the side stakes of the frame for bush plants. Short wires should now be placed from the circle to the top of the centre stake as in the other frame, the only difference being that there will be eight instead of ten divisions. The method of tying should be the same as that for bush plants.

GETTING THE PLANTS TO THE EXHIBITION

As large specimen bush plants and standards are grown for exhibition more frequently than for any other purpose, the question of transporting them to the place of exhibition is a serious one, especially if the distance is considerable. When the distance is not more than ten or fifteen miles they may be carried with reasonable assurance of safety, generally, in spring wagons of some kind. With the plants fastened firmly in the wagon, with reasonably good roads, and a careful driver, they will reach their destination in good order, barring accidents. When the plants must be sent to a consider-

able distance they must necessarily go by rail, either freight or express.

If a number of plants are to be sent, and sufficient time can be allowed, the best method is to engage a box car and send the plants by freight, as they can all be placed in the car and made fast so that no harm can come to them. When the plants have to be sent singly they must be crated for shipment, and the crating thoroughly done. Use strong material for making the crate, but as light as possible while consistent with strength. Make a good base and fasten the pot to the bottom firmly, bracing and supporting it from each of the sides of the crate. To reduce the diameter of the plant, thus allowing the crate to be as small as possible, some of the blooms on the outside of the plant may be drawn up, loose from the frame if such is used, and tied together, and returned to their original positions upon the delivery of the plant. If the pot is properly fastened in the crate, the plant itself will need no support. It will be well to cover the crate with poultry netting, to prevent anything from being dropped or pushed through it; also to

prevent any one from evincing their love for flowers by nipping off a few blooms. Plants properly crated will carry safely hundreds of miles.

SCALES OF POINTS FOR JUDGING PLANTS

The Chrysanthemum Society of America has adopted scales of points for judging plants at exhibitions, which are as follows:

A — Scale of points for bush plants and standards, single specimen or any number up to six, in an exhibition where the class under consideration does not form the chief feature in the exhibition hall:

	Points
Equality of size and forms of plants	40
Excellence of bloom	35
Foliage	25
Total	100

B — Scale of points for bush plants, exhibits of more than six or for any number of specimen plants in an exhibition where the class under consideration forms the chief feature in the exhibition hall:

	Points
Equality of size and forms of plants	35
Size of bloom	40
Foliage	25
Total	100

A CHAMPIONSHIP SPECIMEN BUSH PLANT

Such results are triumphs of the expert's skill, but require much care, experience and time. This plant of the variety Lady Lydia, bore 259 flowers

A PRIZE WINNING STANDARD

Like specimen bush plants, standards are grown chiefly for exhibitions. The amateur will probably get more enjoyment from outdoor kinds and single exhibition blooms

C — Scale of points for plants grown to single stem and one bloom. A height of not over three feet is recommended for plants in this class, and pots not over six inches in diameter:

	Points
Excellence of bloom	40
Compact, sturdy growth	35
Foliage	25
Total	100

CHAPTER V

The Science and Practice of Feeding

Chemical analysis of the plant — Sources of food supply — Danger of overfeeding — Preparing liquid fertilizers — Varying the foods — Surface dressings

While it is not absolutely necessary that the grower should know the chemical composition of the plants under his care to enable him to produce good plants or blooms, this knowledge may prove beneficial to him and aid him materially in providing the necessary food for his plants, and should, at least, make his work more interesting. Dr. A. B. Griffiths, the eminent agricultural chemist, has given the chemical composition of the chrysanthemum, in one-hundredth parts, determined by analysis. The element nitrogen forms 2.92 parts of the entire organic substance of the plant. The mineral substance is made up of:

Potash	16.2 parts
Lime	26.3 "
Soda	10.4 "

Magnesia	10.2 parts
Iron oxide	3.7 "
Phosphoric acid	19.5 "
Silica	6.0 "
Chlorine	3.0 "
Sulphuric acid	4.7 "
	100. "

If the food supplied to the plants were based upon a literal assumption of the facts as demonstrated by the analysis, we should probably be obliged to go to the druggist to have it prepared. The practical experience of many growers for years, however, has demonstrated the fact that soils generally contain enough of *most* of the elements necessary to the development of all forms of plant life. The soils found in practically all parts of the United States, with the exception of the Western deserts and alkali regions, contain more or less of all the elements in the structure of the chrysanthemum. Generally there is an insufficient supply of *some* of the elements for the highest development of the plants; consequently we must supply the deficiency.

ELEMENTS OF PLANT FOOD

As it is practically impossible for us to know positively how much of the different

necessary elements the soil may contain, we can only treat the different soils intelligently by grouping them under three general heads and designating them rich, medium, and poor. Even rich soil should have some fertilizer applied to it at some time, as the elements of plant food are constantly being absorbed by the plants growing in them and are being dissolved and carried away by rains; or, as in the case of plants growing in pots, being washed out by the daily waterings. As rich soils are rarely to be had, we will assume that the soil which has been prepared for the general pottings is of medium fertility.

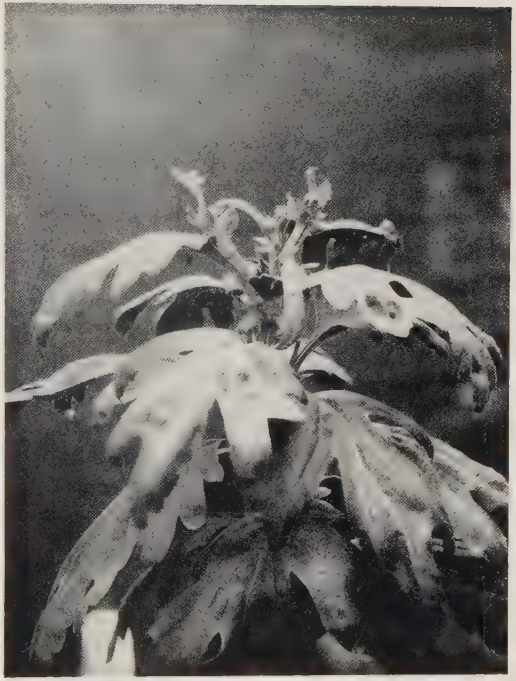
THE DIFFERENT FERTILIZERS

What are the elements in which the soil is likely to be deficient? From what sources may we best procure those elements? The practical experience of cultivators of the soil, aided by the scientific research of competent chemists, has demonstrated the fact that, with rare exceptions, soils generally contain sufficient of all the elements except nitrogen, phosphoric acid, and potash. The available sources of supply of these three

Looking down on the cluster of buds. The crown bud is in the centre ready for "taking"

Removing the undesired terminal buds, or "taking" the crown bud. A steady hand, a bright eye and a sharp knife are needed if the crown bud is to remain unharmed

TAKING THE BUD—1



The result of not taking the bud. The terminal shoots are wasting much of the vigour of the plant. It is not too late, however, to remove all but the crown bud

A terminal shoot threatening the crown. It should have been cut or pinched out when a mere bud, but can even now be removed to help the plant

TAKING THE BUD—II

elements are various animal manures, refuse from the carcasses of animals, and various mineral substances. Animal manures all contain more or less of each of the three elements needed, and the urine more of them than the solid matter. Manure from horses, cows, oxen, or sheep is the most desirable, that from sheep containing more than three times as much nitrogen as that from cows, while that from horses contains, when fresh, about twice as much. Cow manure is always preferable to horse manure, however, because of its ability to retain the fertilizing elements longer. Sheep manure, if properly cared for, is better than cow manure, but less of it should be used, proportionately. Ground bone or bone meal that has been properly prepared is one of the best and safest sources of plant food. This contains a large amount of phosphoric acid, considerable nitrogen, and lime. Dried blood and tankage supply nitrogen, as do also nitrate of soda and sulphate of ammonia. Nitrate of soda contains nitrogen in the most available form of all the sources of supply. Nitrate of potash is a good but expensive source of supply for potash. Wood ashes,

if good, contain some potash, but the amount is uncertain. What are known as "complete fertilizers" may be used. These contain all three of the elements in varying amounts. When their nature is fully understood they may be used with good results, but great care is needed or damage will be done.

The soil was supplied with some plant food and in sufficient quantity when the soil and manure were composted and the bone added. This soil should contain sufficient food to give the plants an abundant supply until they have been in their flowering pots long enough to allow the roots to distribute themselves evenly and thoroughly through all parts of it. If the plants have had proper treatment and have made growth as they should have done, they would be ready to shift into their flowering pots at any time from May 20th to June 10th. Assuming that they received their final potting about June 1st, and stopping was discontinued July 1st, the plants should be growing vigorously and the soil well filled with roots by July 15th, when it will be well to consider the matter of supplying them with food in liquid form. It

must be distinctly understood, however, that not the calendar, but the condition of each individual plant, must determine the question of when to begin this feeding. Some varieties may not require it at all. If the plants are not growing vigorously, with heavy foliage or dark-green colour, do not give them additional food. When in fine health the chrysanthemum is a good feeder and a robust grower. If not growing freely it is not in good health, and any attempt to force it into health by increasing the amount of feeding material in the soil will simply aggravate the situation.

SUPPLYING THE PLANTS WITH LIME

While scientific authorities do not consider lime to be a direct fertilizer, the fact that it is a necessary element of the plant food makes it a fertilizer for all practical purposes. As lime appears in the largest quantity of any single element in the ash of the chrysanthemum, a reasonable amount of it should be supplied to the plants; for while most soils contain some lime, many have an insufficient amount, and, as in the case of the

chrysanthemum, practical experience has corroborated the evidence given by the chemist in his analysis. It will be well to supply the plants with more food than the soil is likely to contain. Professional growers know that lime improves the quality of the plants very materially. This is particularly true of plants grown for cut blooms. A liberal use of lime makes the stems stiffer, the foliage firmer, and gives the blooms more substance. Nitrogen is the element that is generally lacking more than the others, because it is more quickly absorbed, dispelled, or wasted.

While lime forms such an important part of the substance of the chrysanthemum, it is rarely supplied at the time the soil is composted, for the reason that the plants do not require it so much when small; and also for the reason that lime, in the form in which it is generally used, has the power to a greater or less extent to set free ammonia, which is one of the forms in which nitrogen is supplied to plants, thus wasting more or less of the most valuable fertilizing element. Lime may now be easily supplied to the plants in several ways. A surface

dressing of wood ashes, applying a small handful to each large pot, is one way, as this product contains considerable lime. Wood ashes may also contain a small amount of potash. A dressing of air-slaked lime may be given in the same proportion as the wood ashes. The best method is to slake a half bushel of good lime in a barrel. After it is well slaked, fill the barrel with water. Use this lime solution, well stirred, at the rate of one gallon to eight or ten gallons of clear water, giving the plants a watering with it every ten days or two weeks. Assuming that feeding the plants with liquid food was begun July 15th, a watering with lime water is given at the outset. Some liquid manure should be prepared for the next application. Get a fifty-gallon barrel and an old burlap bag, into which put about a bushel and a half of fresh cow manure; that taken from the stables is the best, as it will contain some urine. Put the bag of manure in the barrel and fill the latter with water, allowing it to stand for two or three days, giving the bag a stirring each day. Apply it to the soil in the pots diluted with clear water in

the proportion of one gallon of liquid to five or six gallons of clear water. In using liquid fertilizers of any kind do not apply them when the soil is dry. If such is the case give the soil a watering with clear water before applying the liquid. Never give the plants two successive waterings with liquid fertilizers. Follow a watering with liquid fertilizer by one with clear water. This method not only distributes the feeding through a given period of time, but is much safer. One or two waterings with any fertilizer of a given strength may do no harm, but a third watering of the same strength might cause one or more chemical elements to accumulate in the soil in sufficient quantity to cause injury to the plants.

The soil is a laboratory where chemical changes are constantly taking place under favourable conditions of moisture and temperature, and during the summer it is believed that they are sometimes quite rapid.

In the case of chrysanthemums growing in less than a cubic foot of soil — almost completely filled with roots — any material changes are likely to affect the health of the plant, and whether beneficial or detri-

mental can only be determined when probably too late. Unless you desire to experiment, regardless of results, it will be the part of wisdom to err on the side of safety. Clear water, judiciously applied, acts as a restraining and rectifying agent, dissolving, diluting, and distributing the chemicals which the soil contains, as well as bringing them in contact with the roots in the only form (soluble) that they can absorb them, and, with proper drainage, carrying away excess and minimizing the danger of any chemicals accumulating in the soil in sufficient quantity to do injury. It is also better to change the kind of liquid fertilizer at least every week. Having given the plants a watering with lime water, followed by a week of watering alternately with cow manure and clear water, some other form of food may be supplied.

NITRATE OF SODA

This is an excellent medium for supplying the plant with nitrogen, and, when judiciously used, will generally benefit the plants greatly. It is entirely safe to use at the rate of one half a tablespoonful (equal to

about one half an ounce) to two gallons of water.

NITRATE OF POTASH

For supplying the plants with potash, this, commonly known as saltpetre, is the best of all materials that can be used for the purpose. It is quite expensive, but, when small quantities are needed and it is used as economically as possible, is the most satisfactory of all the forms of potash. It also contains considerable nitrogen, and may be used in the same manner and the same proportions as nitrate of soda. The plants should by all means have a week of watering with this food early in the feeding season.

SULPHATE OF AMMONIA

This fertilizer contains a greater amount of nitrogen than any other. It is slower in action than nitrate of soda. It is also somewhat heavier, but may be used in the same proportion by weight.

COMPLETE CHEMICAL FERTILIZERS

These may be used if their strength and character are understood. There are in-

numerable brands, containing varying amounts of the three required elements. By the laws of most states, the manufacturer is compelled to state the formula on the package containing the fertilizers. If any are to be used for chrysanthemums, those should be selected that have a low percentage of nitrogen and reasonably high percentages of phosphoric acid and potash. There are some brands that are now prepared expressly for chrysanthemums and sold by seedsmen. The ordinary brands may be safely used at the rate of a half-tablespoonful to two or three gallons of water, while the special brands have special directions given for their use. A fertilizer containing 2 to 3 per cent. of nitrogen, 7 to 8 per cent. of potash, and 9 to 10 per cent. of phosphoric acid can be safely used for a short period, at a strength of one half a tablespoonful to three gallons of water. Sheep manure may be used for one week of watering, making a liquid from it as directed for cow manure, only do not use more than one half bushel of manure to the barrel.

It is not necessary that all the different fertilizers here specified shall be used. A

choice of them is optional with the grower, using a reasonable variety for change. These supplemented by light surface dressings will carry the plants to a successful finish. A light surface dressing of fine ground bone meal should be given early in the season. Later, one of good manure should be applied sufficiently heavy to protect any roots that may come to the surface, and about the first of September a small handful of good wood ashes to each pot should prove beneficial. The feeding of bush plants may be continued until the blooms are more than half developed, provided always that the plants give evidence by their condition that they are assimilating the food which is given them.

CHAPTER VI

Growing Exhibition Blooms

Time for propagating — First potting — Growing in beds or benches — In boxes — In pots — Six-inch pot plants — Planting — Watering — Staking and tying — General care — Feeding — Prevention of damage by insects and disease — Taking the buds and disbudding — Crown buds — Scalding and dampening of the blooms — Shading — Cutting — Storing — Packing — Shipping — Dressing the blooms — Staging — The results

For getting first-class blooms of most varieties for exhibition purposes the plants should be propagated before May 1st. While good blooms may be had from plants propagated as late as June 1st, the best flowers will generally be produced by plants that have been propagated during the months of March and April, other things being equal. Some varieties will produce decidedly the best blooms from plants propagated as early as February. With the exception of a few varieties, however, plants that are propagated from April 1st to 20th will produce first-class blooms. Follow the instructions and suggestions given under

the head of "Propagation" (Chapter III). Potting should be done as advised for bush plants. As the sun will be much higher and its rays much more powerful at this time, the plants will not necessarily need to be placed so near the glass as is advisable for bush plants, and they will require shading for a few days longer. They should then be given full benefit of the sun and during the hottest part of the day should be sprayed overhead several times with clean water.

What is the best method of growing the plants? The answer will depend largely upon contingent circumstances. If the grower must be economical of both space for the plants and labour bestowed upon them, the best method will be to grow them in either solid beds or raised benches. Solid beds are objectionable because they do not allow the grower sufficient control of the roots, generally. If they have to be used, abundant drainage must be provided by placing under the soil in which the plants are to grow at least six inches of broken stone or bricks, or coarse clinkers and cinders from coal. Benches about six inches deep,

The crown bud developing. It is marked by the absence of leaves about the flower (see Plate XVII). Pinch off all terminal buds whenever they appear

A well developed "terminal" characterized by the thick foliage about the bud. The crown bud was probably removed just below the lowest raffia band

THE GROWTH OF THE BUDS

The stem of the crown bloom is bare of leaves for a considerable distance. The flower is often larger but sometimes lacks colour and quality

A terminal bloom of the same variety (Wm. Duckham). Leaves are produced all the way up to the flower, which is usually of excellent quality

BLOOMS FROM CROWN AND TERMINAL BUDS

containing from four to five inches of soil, are preferable to solid beds. These must also be provided with abundant openings in the bottom for draining away any excess of water. Growing the plants in boxes that will contain from six to ten plants is a very satisfactory way. In fact, when not more than two or three hundred blooms are required, and the blooms, or at least a part of them, must be kept for some time after they are fully developed, this is the most satisfactory method of all, as when the blooms in any box are nearly matured the box may be taken from the house to the storage room, where the flowers will keep in good condition for a month or more. The plants may also be grown in pots. But save in the case of plants that are grown for the purpose of exhibiting in the pots as they grew, when six-inch pots are used, this is the least desirable method of all, although good blooms may be produced. Plants that are grown to single stem and bloom in six-inch pots are nearly always a feature of chrysanthemum exhibitions. They are also very desirable as house plants and for decorative purposes. For this method

of culture, dwarf-growing varieties should be used and the plants propagated after May 1st.

When ready to be shifted from their first pots the plants should be transferred direct to the soil in which they are to grow and flower. Repotting is unnecessary, except where the arrangements for their permanent quarters are not completed, in which case a shift into four- or six-inch pots would be preferable to having them become checked by being pot-bound.

The distance apart for planting will depend somewhat upon the character of the varieties. Those having large, heavy foliage require more room than those of less robust growth, but as only strong-growing varieties should ever be grown to any extent for exhibition purposes, the standard distance ought to be made ample for the strongest growers. To get first-class blooms this distance should be ten by twelve inches; rows twelve inches apart, and plants ten inches apart in the rows. If space is limited, eight by ten or ten by ten inches will do, but the first-named distance will give the plants better chance for full development.

The varieties should be so disposed that tall-growing ones will not overgrow dwarf ones. The extreme dwarf-growing varieties should be selected for the side benches, tall ones being grown in centre or back benches. It is best to plant varieties in blocks as much as possible, and early, mid-season and late varieties as much as possible together. When grown in large quantities an entire house or section of a house should be planted with early-flowering varieties, another with mid-season, and another with late varieties.

BOXES BEST FOR SMALL QUANTITIES

If the plants are to be grown in boxes, a convenient size for the purpose is twenty-five inches long, twelve to fifteen inches wide, and eight to ten inches deep, inside measurements. This size is easy to handle and will accommodate six plants. Larger boxes that will accommodate ten or twelve plants may be used, but are not convenient for handling, particularly so after the blooms are developed. Cypress is good material to use in making the boxes. Narrow strips, nailed either lengthwise or crosswise of the bottom,

with spaces three fourths of an inch wide, will provide the necessary drainage. The soil for planting should be from six to eight inches deep. This will allow ample room for later surface dressings. When the plants are to be grown in pots, six-, eight-, and ten-inch ones are used. Three plants may be grown to each of the latter size.

Before the plants have filled the soil in their first pots completely with roots the beds or boxes should be filled with soil in proper condition as to moisture. Use soil prepared as directed in Chapter II. The ball of soil in which the young plants are growing should be moist but not wet. For planting in benches or beds have a piece of heavy cord the length of the bed, and stick pins in it at the distance that the rows of plants are to be apart across the beds. Fasten the cord about two inches back of where the first row of plants is to be, at one side of the bed, lengthwise. By placing a plant two inches away from the line, and opposite the point indicated by the pins, the work of planting can be done rapidly. Set the plants sufficiently deep to allow about one

SUPPORTING PLANTS ON STRINGS

When plants are grown in considerable quantities this is a common method of support. Blooms must not be allowed to touch one another

SUPPORTING PLANTS ON STAKES

Heavy wire rods are often used in the same manner. It is usually necessary to fasten the stakes at the top to horizontal wires

inch of soil over the ball of earth from the pots and leave a slight depression about the plants to allow them to be watered for some time without watering the entire mass of soil until the roots have spread through it. Make the soil directly around the plants quite firm; in fact the soil in the entire bed should be made reasonably firm. If the soil is very light it should be packed as firmly as possible. Give one thorough watering soon after planting, after which water only as the plants show signs of dryness at the roots.

SYRINGE AND SPRAY FREELY

Syringing with the hose should be done frequently, and during bright, hot days spray them over two or three times. Syringing and spraying overhead during hot weather can scarcely be overdone, so long as the water is not applied in sufficient quantity to soak and sour the soil and the plants are allowed to dry off as soon as the hottest part of the day is past.

GETTING STRAIGHT STEMS

As soon as the plants begin to root freely through the soil, they will grow rapidly, and

some means must be used to support them in order to get straight stems with good flowers. When the plants are grown in beds or benches there are two methods that may be used. Wires may be stretched lengthwise of the benches above each row of plants and as the plants grow they may be tied to the wires. As they make further growth another wire may be stretched, ten to twelve inches above the first, and this process repeated as often as required. For narrow benches and dwarf-growing varieties this method does very well, but for wide benches and tall-growing varieties is very inconvenient, as it is difficult to get at the plants for syringing, tying, and disbudding. When the plants are grown in considerable quantities the most commonly practised method is to stretch two lines of light wire — No. 18 or 20 is heavy enough — to each row of plants lengthwise of the beds, one a few inches above the soil and the other sufficiently high to be considerably above the plants when they have finished their growth. A piece of hemp or jute twine is then tied from one wire to the other by each plant, and as the plants grow they are tied to the twine. Wire or bamboo stakes may be

used in much the same way, except that the lower wire will not be required. When the plants are grown in pots or boxes, stakes of some kind must be used. For boxes, a good plan is to have stakes of about the required length and place them in the soil at the sides of the box, fastening them in position by driving a small staple over them and into the side of the box. If No. 8 wire is used this will make a firm support.

REMOVE SIDE BRANCHES AND BUSHES

After the plants have become established they will begin to make growths or branches from the main stem at the axils of the leaves. These must be removed or they will absorb the nourishment that should go toward making a strong stem for the future bloom. The plant must be compelled to concentrate all its energies at one point. These side branches are easily pinched out with the thumb and fingers while less than an inch long, and they should never be allowed to get longer. Always be sure, however, to leave one or two of them at the top of the stem, for the stem will frequently "go blind"—that is,

the growing point will become checked, sometimes from no apparent cause, and cease to grow. If all of the side branches should be removed in such case the plant would make no further growth and consequently produce no bloom. In case of the stem going blind, allow the strongest of the upper side branches to grow, and when long enough it should be tied to the support, when it will form the main stem.

The surface of the soil should be stirred frequently to allow the sun and air to act upon it; also to kill weeds that will generally start freely. Suckers will soon begin to grow from the base of the stems. These should be kept in subjection by removing a part of them and pinching out the tips of the others. Some varieties produce suckers much more freely than others. Those that do not produce them freely should have but few removed, as it is upon these that the supply of cuttings for the next year depends.

The depredations of insects and diseases should be forestalled; the ounce of prevention is always worth many pounds of cure. A constant and intelligent watchfulness must

be maintained and treatment given as advised in Chapter I.

TIME FOR APPLYING SPECIAL FOODS

When planting has been done between May 15th and 20th, the plants, if growing as they should, will be ready for some special feeding about July 15th. As the matter of special feeding has been thoroughly discussed in Chapter V, and as the same general principles apply to the feeding of all plants, it is only necessary to make slight changes or modifications of the treatment for plants grown for cut flowers. Surface dressings may be used to better advantage for plants growing in beds or boxes than for those growing in pots. The first food should be an application of fine ground bone meal at the rate of one pound to twenty square feet of surface. Cow or sheep manure water may then be used for a week, followed by an application of lime water or of dry air-slaked lime at about double the rate advised for the bone. Sulphate of ammonia should be given next, after which a surface dressing of well-decomposed cow or sheep manure, about one inch thick, should be applied.

When the buds are well formed one week of watering with nitrate of soda may be given, after which this chemical should not be used again. Alternate waterings with cow or sheep manure water, sulphate of ammonia, and nitrate of potash will give sufficient variety of food, and, if properly applied, will produce first-class blooms. These special feedings must always be consistent with good judgment and observation, bearing in mind the admonitions and advice given in Chapter V.

SELECTION OF BUDS IMPORTANT

About the first of August, sometimes earlier, but generally a little later, some of the early-flowering varieties will begin to form what are known to professional florists and gardeners as "crown buds." The growing tip of the plant will appear to divide, and instead of a single stem continuing to grow there will be (generally) three branches growing from the top of the plant. In the axil of these branches will appear a small, elongated bud. This is the crown bud, a very important factor in the production of first-class chrysanthemum blooms.

There are always in cultivation a few varieties on which the crown bud produces an inferior bloom, but with most varieties blooms produced from crown buds selected at the proper time will prove superior, other things being equal. The question of whether the crown bud shall be used or discarded will occasionally depend upon the variety producing it, but generally upon the date on which it makes its appearance. This matter will be fully discussed farther on. To get first-class exhibition blooms it is important that the crown bud be selected whenever it appears at the proper time. Blooms of the same variety will often be fully one fourth larger from crown than from terminal buds. They will also be fuller and of better substance, and the stem and foliage will generally be better, although some varieties develop a long bare "neck" just below the bloom when the crown bud is used. There are, however, enough varieties in cultivation that do not have this objectionable feature to allow those that do have it to be reserved for purposes in which the neck will not be objectionable. Blooms of pink varieties sometimes lack colour when crown buds are

used, but this also is not a serious objection, if the bud has not been taken too early.

In case it is desired to use the crown bud, all the little branches that have started to grow about it must be removed before they are an inch long, care being taken that the bud is not damaged in doing so. The point of a small knife blade is a good instrument for doing this work. If the branches are not removed, the crown bud will not develop, the branches appropriating all the substance necessary to its development.

If the time is not propitious, or if for any other reason it is desired that the crown bud shall be discarded, remove all of the branches that have started from the top of the plant except the strongest and best one, allowing this to remain and develop. Generally this will grow for about three or four weeks, and then produce three or four globular or slightly flattened buds in a compact cluster. These are known as "terminal" buds, so called because they terminate the plant's season of growth, and if they are all removed the plant will produce no flowers. If it is desired to use a terminal bud for producing a bloom, all of the buds of the cluster are

removed except the central or largest one. The same method may be used for removing these as was advised for the crown bud, and the same care must be taken in order that the remaining bud be not damaged. Thus it will be seen that "taking" the bud is merely selecting and deciding which bud to retain. The operation of removing the discarded buds and growths is called "disbudding." It should be borne in mind that, in disbudding, all buds and growths are to be removed from the given stem of cut bloom plants and from the flowering shoots of bush plants, except the buds that have been taken, or selected, to produce the flower. Disbudding should never be done during the heat of the day, as the growth is then wilted and tough, and there is greater danger of damaging the remaining buds. If done in the early morning or during cool, cloudy weather, while the growth is firm, the buds will snap out very easily.

The question of whether to take the crown bud or allow the plant to grow and develop a terminal bud can only be determined by the judgment of the operator in each individual instance. The date upon which

each appears is the most important point to be considered, and the earliest date on which crown buds may be taken and produce satisfactory blooms will depend largely upon latitude and local conditions. A general principle that may be used as a guide is that cool, dry weather conditions tend to hasten the formation of buds, and vice versa. In the northern hemisphere the chrysanthemum generally forms its buds during the months of August and September. In the southern hemisphere they would be formed in February and March. In the vicinity of the fortieth degree of north latitude, and in the eastern part of the United States, the earliest date on which crown buds of the best mid-season or late exhibition varieties may be taken with reasonable assurance that they will develop good blooms is August 15th, and only a very few varieties will develop satisfactory blooms from buds taken before the 20th. Crown buds of early-flowering varieties may be taken as early as August 1st with reasonable assurance of producing good blooms. Farther north, or when grown at a high altitude, they might possibly be taken a few days earlier; while farther south they could

not be taken so early. There is sometimes considerable difference between plants of the same variety grown in the same locality by different growers. Unless the grower is fully acquainted with the character of the varieties grown, in respect to the bud development, it will be a safe rule to take no buds before August 20th. Some varieties will not produce good blooms from buds taken at that date, but they are few. When a crown bud is formed early in August and is not taken, the branch that is let grow will produce what is called a second crown bud. This differs slightly from the first crown bud in having short terminal growths about it, and they show buds at the same time as the crown bud; almost as soon as the latter can be seen. This second crown bud will generally make a first-class bloom. While perhaps not quite so large as blooms from the first crown bud, it will be better finished.

As the buds are forming, special efforts should be made to have the plants free from all insects, and also means taken to prevent the development of mildew. During the last half of August and the first half of September the hose should be used freely,

although carefully, on the under side of the leaves to dislodge any red spider that may be lurking there, and measures taken to eradicate all aphides; for if allowed to remain and work their way into the opening blooms, which they will surely do if not destroyed, they will ruin the blooms.

As soon as the buds begin to show the first indication of bursting open their scaly covering, all syringing and spraying of the house must be discontinued. If water is allowed to get into the top of the opening bloom there is danger of damping or scalding the tips of the rays or petals. When the blooms are about half open some of the petals on one side of the blooms will be found to be browned, as though they had been scalded by hot water. This has been caused by water accumulating there either from spraying, the drip from the roof, or condensation caused by too much moisture in the atmosphere during cool nights. All watering must be done as early in the day as possible, and no more water used than can possibly be avoided. Abundant ventilation must be provided night and day in order to keep a good circulation of air above and

Blooms are sometimes exhibited singly, but more often in collections of ten, twenty or even thirty in a tub. These are from terminal buds

Flowers of Wm. Duckham from crown buds. Handsome exhibition effects may be obtained by masking the vases with some sort of greenery

EXHIBITING PRIZE BLOOMS

PLATE XXI

BLACK APHIS ON THE CHRYSANTHEMUM

Each insect is a pump drawing out the life juices of the plant. The green aphis is harder to destroy than the black, but there are means for combating both—See Chapter IX.

between the plants, being careful, however, that during stormy weather rain does not get blown in through the ventilators. Ventilation will also aid in keeping the temperature down, which should be as low as possible generally. Forty to fifty degrees at night is the proper temperature after the buds are formed, and while it will frequently be impossible to keep it so low, get it as near those figures as possible. If it occasionally goes below 40 degrees no harm will be done.

Many of the red, crimson, and claret varieties burn badly, particularly if fed after the blooms begin to show colour. Feeding of such coloured varieties should be discontinued early, and if they can be placed by themselves where a light shading can be given them the burning may be prevented. Bright pink specimens will also be benefited by a light shading after the blooms are half developed. Shading further may prove beneficial in preventing, or at least alleviating, damping. This is a trouble that affects highly fed and highly developed blooms of certain varieties, and is very discouraging. The condition is brought about by high temperature, accompanied

by a considerable degree of humidity when chrysanthemums are in flower. It frequently attacks the finest and most beautiful varieties. There is no positive way entirely to prevent this condition; the best that can be done is to endeavour to relieve it so far as possible. Heat appears to be the principal cause of the trouble; therefore any means that can be used to reduce the temperature will probably prove beneficial to a greater or less degree. If the blooms are nearly matured they may be removed to some cool storage where abundant ventilation can be given. Keep as dry and as cool as possible and remove any damaged petals that touch others.

If it becomes necessary to hold the blooms for a week or more after they are matured or "finished," they must be removed from the house in which they were grown when they are about five sixths developed, and put in some place where conditions are similar to those described in Chapter II. When the plants have been grown in pots or boxes they may be removed to the storage room and kept in good condition for a month or more with very little trouble, an occasional

watering and inspection to see that they are all right being all that should be needed if the conditions are right.

When the plants have been grown in beds or benches the flowers must, of course, be cut and stored in some receptacle that will contain water. Whatever means are used for storing them, the blooms should not be crowded. Clean tubs made from half-barrels, with four strips of wood nailed to the sides projecting about two feet above them, to which heavy cord or light wire is attached from one to the other and across from opposite corners, make excellent receptacles for storing the blooms. Fill the tubs about one third full of water, and place the blooms against the supports provided. A tub of this kind will hold from twenty-five to forty blooms, according to their size and the character of the foliage. They should always be cut in the early morning or during cool, cloudy weather, while the foliage is firm, and should be placed in cold water immediately. Always cut them with a good length of stem, particularly if they are to be exhibited in large vases, or if they must be kept for considerable time. Three to five

feet will not be too much for large flowers with good stiff stems. The water in which they are kept should be changed at least twice each week, when a small piece should be cut from the end of each stem. While in storage the blooms should be looked over and any decaying petals removed.

SELECTING THE BLOOMS FOR EXHIBITION

When ready to begin packing, the prospective exhibitor must himself become a judge. He would be unwise to take to the exhibition anything but his best blooms, and the choice of the best will need some careful comparing and selecting. After the number to be exhibited has been decided upon, look the variety or varieties over carefully, select the required number of blooms for a specified exhibit, and place them where they can be examined in a good light. If the number should be twelve, compare them carefully and select nine or ten of the best. Then get three or four more of the best that have been left and compare them with those already selected, as sometimes a second examination may change your opinion of a bloom. It is only by the most rigid inspec-

tion that the best can be selected in many instances. After the required number has been selected, put aside one or two of the best remaining blooms for each exhibit, as extra emergency blooms, to be used in case of accident to any of the first choice. In packing, always put in at least 10 per cent. of the number to be exhibited in each class, as emergency blooms.

A GUIDE TO THE SECTIONS

The following analysis of the sections will enable any one to properly place any flower. In the trade list, the varieties are usually grouped under these section headings:

A. Anemone-flowered forms: rays in one series: disk high and rounded
B. Flowers regular ..... 1. Anemone
BB. Flowers irregular ..... 2. Japanese Anemone
AA. Double-flowered forms: rays in many series: disk absent
B. Rays reflexed ..... 3. Reflexed
BB. Rays incurved .....
C. Form regular ..... 4. Incurved
CC. Form more or less irregular ..... 5. Japanese Incurved
BBB. Rays of various shape; forms various. 6. Japanese

PACKING THE BLOOMS

When the blooms are ready to be taken to the place of exhibition, and especially when they must be sent to a considerable distance

the question of packing them in order to have them carry safely, and yet not occupy so much space as to make the boxes or packages unreasonably bulky and inconvenient for handling, will require intelligent and careful thought. Unless the packing is thus thoroughly done the blooms will, in all probability, be ruined for the purpose intended, and all the labour that has been bestowed upon the plants and blooms for the entire season will have been wasted.

There are two good methods of packing the blooms, either of which, if properly carried out, will get the flowers to their destination in good condition. The method generally used by florists who exhibit large quantities of blooms is the most simple. For this method, boxes made of some reasonably light but strong material, twenty-four to thirty inches wide, fifteen to eighteen inches deep, and about six feet long, are best. These boxes should first be lined with one thickness of heavy, glazed wrapping paper, being careful to have the pieces overlap each other to exclude air. They should be held in place by a few tacks. Then line with from three to

six thicknesses of newspaper, according to the condition of the weather and the distance that they have to be transported. Have ready some strips of soft wood about one inch square for cutting into cleats. When the required number of boxes has been prepared, they should be taken to the storage room, or some convenient place that is cool, to be packed.

The blooms should be cut and placed in water at least twenty-four hours previous to the time that they are to be packed. They should be wrapped in tissue paper before being packed. For the incurving forms the paper should be tied around the stems, just below the blooms, and carefully drawn upward over the top and fastened by tying. For the decidedly reflex forms the paper may be placed on top of the blooms and drawn downward, being tied to the stem below the flower. In either case the paper should only be drawn sufficiently tight to hold the petals firmly. Make some rolls of excelsior about three to four inches in diameter and as long as the width of the box. Place one of these rolls far enough from one end of the box to allow room for the largest blooms. Select

the largest blooms, and also those having the longest stems, that it is desired to have staged, for the ends of the boxes. As fast as the paper is tied about the blooms, place them in the box, allowing the neck of the flower to rest on the roll of excelsior, and be sure that the latter is sufficiently large to prevent the blooms from touching the bottom of the box. Place as many blooms side by side as will fill the width of the box, then cut off two pieces, about six inches long, of the strips of wood that have been provided for cleats, and nail them perpendicularly, one to each side of the box, inside, near the bottom, and from twenty to twenty-four inches from the end. Now take a thin strip of wood — a lath that will just fit across the box will do — and, pressing it firmly down on the stems, nail it to the two cleats that have been nailed to the sides of the box. This is to prevent the blooms and stems from shifting in the box. If carefully done, two or even three rows of blooms may be placed in the box before the cross strips are nailed in, making less work and also not interfering with packing the second and third rows of blooms. After the first row is properly placed, put in another

roll of excelsior and another row of blooms, continuing until about one fourth to one third of the space in the box is filled. Then begin at the other end of the box and repeat the operation. This will allow the stems to overlap each other at the middle of the box. If blooms are to be exhibited in classes calling for short stems, the blooms for such classes may be packed in the vacant space near the centre of the box.

In packing, it will be well to keep the blooms of each variety together; also to arrange them so that all that are to be exhibited in each class can be unpacked in succession. When they are to be unpacked by some one other than the packer, the blooms intended for the different classes should be plainly marked and labelled accordingly. If the blooms must remain in the boxes for any considerable time, the foliage of each row should be sprinkled lightly with clean, cold water, or, what will be better, lay sheets of newspaper that have been moistened over each layer of stems, being careful at all times to avoid getting any moisture on the blooms.

By the other method of packing, deeper and

larger boxes may be used, and if carefully done less danger of damage to the blooms will be incurred. The boxes should be lined with paper, as for the former method, and strips of wood provided for cleats. One cleat should be nailed to each side of the box, about seven or eight inches from the end and at the bottom. A strip of wood should be nailed to these, at such a height from the bottom that the blooms will be kept from touching the bottom of the box when they rest upon it. Wrap the blooms in tissue paper as before, then place them in the box with the neck resting on the cross strip, to which they must be tied firmly with cotton cord. Another strip may be placed at a sufficient distance from the first to allow another row of blooms to follow, and the packing be continued as in the former described method, the only difference being that the strips take the place of the rolls of excelsior, and the blooms are tied firmly in position. With strips nailed across the box to hold the stems in place, the boxes will stand considerable rough usage with no harm to the blooms. If the box is of sufficient depth, a second and third tier of blooms

may be packed above the first, as the cross strips will support the entire weight

The principles to be observed in all methods of packing blooms are: making the package as light as possible consistent with strength, providing sufficient protection from extremes of temperature, arranging the blooms so that they cannot shift, and preventing them from suffering from evaporation without getting the blooms moistened. See that covers are securely fastened, and in case of using large boxes nail some cleats on the outside near the ends for the carriers to take hold of. For the smaller boxes a piece of rope tied about them will answer the same purpose, and will probably save the boxes some rough usage. There is but one means of transporting the blooms when they must be sent over the rails, and that is by express.

Get receipts from the agent at the point from which shipment is made, so that, in case of necessity, you can get the boxes upon arrival at the point where they must be taken from the car. The regular express delivery is not always as prompt as necessary to get the blooms to the place of exhibition in time for staging, and special delivery must

be provided. Aim to have your exhibits all staged as soon as possible, and to do this no time must be lost at any point of the work.

STAGING THE BLOOMS

Upon arrival at the place of exhibition get in communication with the secretary and the manager of the exhibition as soon as possible. From the manager learn where the different classes are to be staged, what vases are to be used for your exhibits, and where a supply of water for filling the vases may be had. From the secretary secure the entry cards for all of your exhibits. Get some vases filled with water and, as fast as the blooms can be unpacked, place them in the vases. As soon as a vase is filled with the required number of blooms place it in the position designated by the manager, and, if not already done, tie to one of the blooms a label with the name of the variety written or printed thereon. Get all of the blooms unpacked and in water as soon as possible; the arranging can be done after the unpacking is finished. At the chrysanthemum exhibitions held in Great Britain the dressing of the blooms is an important part of the

staging operations. This means the removing of such petals, with the aid of a pair of small tweezers, as tend to make the outline of the blooms irregular, and of working petals to fill vacancies, the idea being to make the blooms as smooth and regular as possible. This operation is, fortunately, not practised in America.

When the blooms have all been placed in water and labels attached, begin to arrange them in each vase in such a manner that each flower will show to the best advantage, as it is important that all exhibits shall be thus displayed. It is each exhibitor's duty not only to himself but to the management to do so. Much can be done in this way by the exhibitors, particularly where collections of different varieties are being staged. While supports for blooms that can be seen above the vase are not allowed, much can be done to improve the appearance of a vase of blooms when the receptacle happens to be larger than is necessary for the number of blooms that must be placed therein, as is often the case, by putting a wad of paper or some other material in the vase to hold the stems in the desired position. The

displacement of a single bloom by a few inches will often destroy the best effect of a vase of flowers. When the exhibit consists of a collection of three to twelve vases of different varieties, those having the stiffest and straightest stems should be placed in the centre or at the back, if only one side of the stand is open to the view of the visitors, placing varieties having shorter and weaker stems in front and at the ends.

The arrangement of the colours in relation to one another should also receive intelligent consideration. White and yellow will most likely be the predominating colours and they will harmonize with each other and with most other colours, if properly disposed. In collections of a given number of varieties, "one bloom of each variety," the blooms are almost always exhibited with short stems and placed singly in small vases, four rows deep on the stand or table. In staging such an exhibit the largest blooms having the strongest stems should be placed at the back, and the stems of the back row should be two or three inches longer than the next one to the front in each row, thus making a gradual sloping effect to the collection. Here, also,

good taste should be displayed in placing the colours for the best effect.

In England there are a great many blooms exhibited on what are known as "boards." This method of exhibiting is but little used in America. The arrangement is to provide a small platform, 18 x 24 inches, made so that the back is six inches high and the front three inches. In this are bored twelve holes, three from front to back, and four from end to end, at equal distances. These holes are fitted with tin tubes for holding water, which have a spiral groove. Another tube without a bottom and having a funnel-shaped top, with a spiral ridge fitting into the groove of the larger tube, is used. The blooms are placed in the smaller tube and the stem is wedged fast; then the small tube is placed in position in the larger one, and, by means of the spiral arrangement, can be placed at any desired height. This method has never been popular in this country, although the managers of many exhibitions include one or two small classes for it in their schedules.

The showing of blooms with long stems is the popular method of exhibiting in America, and when vases of from twenty-five to one

hundred blooms of one colour are well arranged they produce an effect that is truly magnificent. For arranging such exhibits, the blooms must have stems from three to five feet long. Vases of chrysanthemums, with other material arranged for effect, are a prominent feature of most exhibitions. Here simple combinations of colour are generally most pleasing. One variety of chrysanthemum, with some well-coloured autumn leaves, is often successfully used. One of the prettiest arrangements that I have ever seen was a vase of medium-sized flowers of a white variety interspersed with sprays of *Berberis Thunbergii*. The bright scarlet berries of the barberry in contrast with the white chrysanthemums produced a beautiful effect, and won the premier prize in keen competition.

ETHICS OF EXHIBITING

Before going to the exhibition endeavour to understand as thoroughly as possible the principles upon which such affairs are generally based, and, in particular, the one in which you propose to take part. Also study the specific rules and conditions under

which the exhibition is held. If there is anything that is not clear, or that has an appearance of unfairness, try to get from some official source an explanation of the matter. If such explanation is not satisfactory, either take note of it and seek for further information or do not make your proposed exhibits. Endeavour to have a clean start, then conform to the rules yourself, and, in fairness to yourself, see that your competitors do the same in all matters of importance. If the results are not as you hoped and believed they would be, accept them philosophically and manfully, unless there should be some flagrantly erroneous decision, under which circumstances a protest entered in accordance with the rules and in a gentlemanly manner is the privilege of every exhibitor. Such instances are very rare, however, and while decisions may sometimes appear wrong, they are almost always attributable to honest difference of opinion.

CHAPTER VII

Growing for Commercial Purposes

An important branch of horticultural industry — Selling your plants — Growing for cut blooms — Packages for shipping — Packing — Growing small bush plants — Best form of plants for plant decorations — Stock plants — Decorating — Importing

The chrysanthemum occupies an important place in horticultural industry. Owing to the fact that it gives but one crop of flowers annually, and does not occupy the house in which it is grown more than five or six months of the year, it is not considered as a permanent source of income.

It is difficult to get positive information as to the amount of greenhouse space devoted to the growing of plants for market. From such information as is available, gathered by the United States Department of Agriculture at Washington, the amount paid to the retail dealers in the Unites States for chrysanthemum plants and flowers during the season of 1906 was not far below the million-dollar mark. Unlike that of the rose, carnation,

As the rose is the queen of garden flowers, so the chrysanthemum is the queen of winter flowers, indoors

It is a delight to arrange chrysanthemums. Their beauty blends in innumerable ways with the foliage of all the most effective ferns, palms and other house plants

of packing them to prevent freezing must be properly understood, and the details attended to carefully. Packages weighing more than four pounds cannot be sent by mail; consequently when plants in considerable quantity are to be shipped they must be forwarded by express. First see that the soil in which the plants are growing is reasonably moist; if not, it must be made so. Pieces of paper, about four inches longer than the entire length of the plant and ball of soil, and wide enough to go twice around the plant, should be provided. Turn the plants out of the pots, which should not exceed two and one half inches at this stage, lay them on the piece of paper so that about two inches of it extends beyond the plant and soil at each end, roll the plant in the paper, and fold the lower end to hold it in position, leaving the top end open. Then line a good wooden box, of the approximate size required for the number of plants to be shipped, with a thickness of heavy, glazed wrapping paper, making sure that the pieces overlap each other well. Next put in one or two thicknesses of heavy felt paper, or else the same quantity of cotton batting. And after that

from five to ten thicknesses of newspaper, according to the severity of the weather. When several varieties are to be packed in one box, some means must be used to enable the person who unpacks them to distinguish the varieties.

When from two to five plants of one variety are sent, probably the best method will be to wrap them in other paper with a piece of cord about it, thus making them into a loose bundle that can be packed flat. When several of one variety are sent, the kinds may be kept separate by making divisions with heavy paper that will not tear easily. At least one label must go with each variety, and the number of plants of that variety should be written on it. Layers of excelsior may also be used to enable the varieties to be distinguished, and in large boxes a layer of this material on the bottom and between each two layers of plants may prove beneficial. Place the plants closely and firmly together, with the ball of soil against the end of the box. When the first row has been placed, begin another, with the plants in the same relative position, but with the tops in the opposite direction, and

continue until a layer has been placed over the entire bottom; then begin another layer, placing the plants in the opposite direction to that in which the first layer was placed. Continue until the box is full or the plants are all packed. Should there be any vacant space it must be filled with excelsior or some other material, as keeping the plants firmly in the position in which they are placed is the most important point to be observed in packing. Boxes more than twelve inches deep should not be used.

In warm weather a different method must be employed. Packed as above advised, the plants would almost surely heat if kept in the box for more than twenty-four hours, and would be spoiled. The plants should have the paper wrapping about the ball of soil only, and the box will need no lining. If the time likely to be occupied in transit is not more than three or four days, select a box that is a few inches deeper than the extreme height of the plants, stand the plants upright as closely as possible, and, after three or four rows have been placed, put a strip across the box, pressing the plants together as tightly as possible. Continue until the bottom of the

box is covered, then nail strips across the top, leaving spaces from one to two inches between the strips. If this work is done properly, even if the box be turned upside down, the plants will remain undisturbed. When the plants must be a long time in transit, the best plan for packing is to use a shallow box having strong cleats nailed in each corner a few inches higher than the plants. Nail a strip to the top of the cleats at the ends of the box, then pack the plants as before, and nail strips from the two end strips on top, leaving spaces between. This will leave the plants open at the sides and on top, allowing a free circulation of air about them. It may be advisable to nail a strip to the cleats at each side as a protection.

SHIPPING BY MAIL

In preparing plants for shipment by mail they must be protected from cold as thoroughly as when shipping by express, but the boxes will necessarily be quite small, and should be made of thin, light material. The soil should be carefully washed from the roots of the plants and the roots have a

small amount of damp moss wrapped about them. Labels made from some tough paper cut in strips, with a slit in one end through which the other end is drawn, thus forming a slip-noose, may be put around the plants. A lining of cotton and waxed paper only should be used inside of the box, which must be covered with cotton and as many thicknesses of paper on the outside as the weather conditions demand. Mark all packages plainly with the name and address of the consignee and in such manner that it cannot be lost. Also mark them all prominently with the legend, "Perishable plants. Keep from heat and cold. Deliver promptly."

PACKING PLANTS FOR EXPORT

"In packing for export," says Smith's "Chrysanthemum Manual," "there are two systems employed, one for the winter months, when they are packed tight, the other for summer, providing plenty of light and air for the plants. When packed close, excessive moisture is to be strongly guarded against. Under such conditions the plants are sure to rot if they remain packed more

than six days. There is sufficient moisture in the plant itself to retain vitality for some time, and whatever is used to fill up intervening spaces must be perfectly dry. Moss, excelsior, and cocoanut fibre are the best materials for filling.

"Plants that are to be exported should be put into a cold, airy house for a week or ten days, and watered very sparingly, in order to harden the wood. If packed too soft they generally perish. Before placing in the boxes remove most of the foliage, as it is very apt to die and cause decay. The balls of earth should be wrapped in dry moss and tied securely. Place the plants in an upright position on the bottom of the box, using a cleat to each row; in this manner they are held securely in the desired position. If the weather is severe, protection against frost will be necessary, and may be provided as previously described. In hot weather the same method of packing is employed, with the exception that wet moss is used, wrapping each ball with wax paper. Holes are bored through the sides of the box to admit light and air. The holes are generally covered on the inside with wire screen to prevent

mice damaging the plants while on shipboard.

"Small foreign shipments are sometimes made by removing the soil and placing the plants in tin boxes, filling the intervening spaces with dry cocoanut fibre or moss. It is very important, when packed in this manner, that all the leaves be removed except those undeveloped at the top. If the plants have been hardened there will be little loss. It is easy to test a system of packing by preparing a shipment, putting it aside, and opening it after a period of time equivalent to that required for transit to the proposed destination, and noting the condition; or pot up the plants and determine how many will survive."

GROWING FOR CUT BLOOMS

Growing the plants for cut blooms, whether for wholesale or retail trade, may be done with reasonable assurance of fair profit if good, economical business methods are used. If the purpose is to grow for the wholesale market, the grower should, if possible, locate near some large city, where there is likely to be a good and steady market for his product.

Growers that are located a long distance from their markets are considerably handicapped, notwithstanding the many present-day conveniences of telegraph, telephone, and fast express trains. The blooms may be shipped long distances with perfect safety, but the grower cannot take advantage of any increased demand or price as well as if located within a short distance of his market. Convenient and readily available shipping facilities are also an important consideration in growing for the wholesale market. If the distance is so great that it is not practicable to deliver the blooms by horse and wagon, a good railroad express is a necessity. While it may seldom be necessary to do so, the grower should be so located that he can deliver flowers to his customer within two or three hours from the receipt of an order.

When blooms are to be grown for the wholesale market, the percentage of profit will generally increase proportionately with the number of blooms grown. When grown in large quantities, large houses may be used, and the labour and all other expenses will be proportionately less than for a small estab-

lishment. The method of growing the blooms for market will not differ materially from that advised for growing exhibition blooms, but the varieties should be carefully selected, growing only those that the market demands. Comparatively few of the odd or mixed colours will sell. Good self-colours of white, yellow, and pink are what are required. Good stems and foliage are also demanded, and for convenience in growing, varieties of dwarf-habit and short-jointed growth should be selected. The blooms should be firmly built and of good substance. Some of the most beautiful varieties are rarely if ever seen in the large florists' stores, for the reason that the blooms lack sufficient substance to stand shipment without damage. Such varieties can be used profitably only by those who sell their product directly to the consumer.

While it will seldom be found profitable to give as much attention to the plants in the matter of feeding as has been advised for exhibition blooms, the plants must receive practically the same treatment in all other respects. Early and mid-season varieties should be grown from crown buds generally,

but for late varieties the terminal bud will be best. Except in the case of the very early varieties, when there is a demand for the blooms, and prices are high, they should not be cut until they are fully matured, as they will ship better and give more satisfaction to the dealers and their customers.

Some time before any of the blooms are ready to cut, an arrangement should be made with one or more commission men or retailers to take the entire crop of blooms, receiving a certain amount of them each day. If the blooms are good, and you have enough to be able to ship a considerable quantity each day, you will have little difficulty in finding customers for your crop. It is good policy to keep in close touch with the commission man during the shipping season, and always send promptly whatever amount of blooms has been agreed upon, or any that may be required for special orders. Blooms should always be cut and stood in water for at least twenty-four hours before being shipped. The best grades of blooms should be cut with stems from two to four feet long.

When cut blooms are to be shipped to market, convenient packages must be pro-

vided for carrying them. Some growers ship them in boxes of any cheap kind that can be obtained, that answer the purpose, and do not have them returned. Where light boxes of proper sizes can be obtained cheaply, this method may prove economical; but generally it will be necessary to provide boxes that will last at least for one season's shipments, and if reasonably well made they may last for several seasons. Boxes eighteen inches wide, twelve to fifteen inches high, and four to five feet long will carry twenty-four first-grade blooms, and from thirty to thirty-six smaller ones. Smaller sizes of boxes may be used for second and third grade blooms. The boxes should be bound with light bands of hoop iron, and light cleats fastened inside at the corners and the centre will strengthen the boxes greatly. The covers should be fastened by hooks, or hinges and hasp, in such a manner that they can be removed entirely in packing and unpacking.

The general principles advised for packing exhibition blooms will apply to packing for market. It will not be necessary, however, to use more than one or two thicknesses of paper lining, unless the blooms will be

several hours in transit. Nor, except for some fancy grades of blooms, will it be necessary to wrap them in tissue paper; a sheet of tissue or waxed paper laid over each row of blooms before the next row is placed will be sufficient. Pack as closely as possible without crushing, and hold the stems firmly in place by either putting one cleat across them after the box is filled or wrapping a good-sized roll of excelsior in paper and laying it across them in such a manner that the cover will press it firmly on them when it is fastened in place.

When the grower has the opportunity to sell his flowers at retail he can generally realize a larger percentage of profit than when he sells at wholesale, but naturally the number of blooms that can be disposed of will be limited.

DWARF BUSH PLANTS FOR RETAIL TRADE

In the larger towns and cities there is generally a market for a considerable quantity of small bush plants grown in six- or eight-inch pots. Dwarf-growing varieties having stiff stems, and good foliage should be chosen for this purpose, and the plants

should be propagated in April or early in May. They should be stopped when one or two inches high and kept stopped as directed for specimen bush plants until about the middle of July. With good care they should make compact plants from twelve to eighteen inches high, carrying from twenty to thirty nice blooms. They will require but little if any staking or tying. The pots may be plunged in soil in a bed or bench, if desired, to save watering; or the plants may be planted in the soil from their first pots, and be grown in the bench until after July 15th, when they may be lifted and potted. This method will produce larger plants than keeping them in pots all summer, but will require larger pots, and they may suffer from the disturbance at the time that they must be potted, unless given careful attention. After potting they should be kept shaded from bright sunshine for several days, the atmosphere of the house being kept close and moist.

Another form of plant that is very useful to the commercial florist is one bearing from six to twelve medium-sized blooms that can be used in groups of foliage plants at wed-

dings, receptions, or any private or public function. For this purpose the plants may be propagated in May and stopped twice or three times. Some of the tall-growing varieties may well be used for this purpose. Part of the plants may be grown without disbudding, as the sprays of bloom will be more graceful than so many larger blossoms, although large blooms may also be used with good effect. Many varieties of pompons grown in pots, or in benches or even outdoors, and lifted and potted, are useful for this kind of work.

Florists located in small towns, where the prices paid for large blooms cannot be obtained, may produce sufficiently good blooms for the majority of their customers by growing their plants either in beds or benches under glass, or even out of doors — lifting and potting them after the buds have set — and allowing from three to six blooms to a plant.

Many growers prefer to grow their stock plants out of doors, lifting and potting them or planting them in boxes before cold weather sets in. Where cut blooms are grown in considerable quantities some rev-

enue may be obtained by selling stock plants. As soon as the blooms are cut from a section of bed or house, the stock of each of the varieties desired to be grown the next year should be lifted and potted, or planted in boxes that are from four to five inches deep, and stored. Surplus stock may be sold if a market can be found for it.

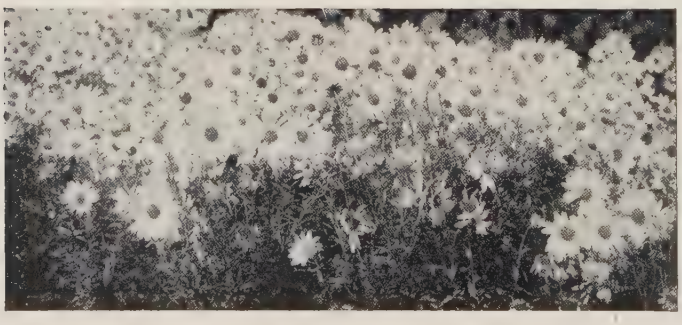
MINIATURE CHRYSANTHEMUMS

Plants that are from ten to fifteen inches high may be had with comparatively little trouble, and a limited mumber sold at a fair profit. Cuttings of the most dwarf-growing varieties may be made from the middle of July to the middle of August. They must be put in a closed frame, kept as cool as possible, and given only sufficient ventilation to keep the air from becoming stagnant and causing damping and fungus. If a gentle bottom heat can be maintained under the cuttings they will root more quickly. Some fermenting stable manure will provide such heat. As soon as rooted they may be potted into small pots and kept in the closed frame for a few days, after which they may be gradually hardened by

POTTED PLANTS GROWING OUTDOORS

The variety of chrysanthemums that can be grown all summer in pots along the south side of a house, where a little shade from the full sunshine is provided, is surprising and gratifying in the extreme

The garden varieties are not only profuse bloomers but among the hardiest of plants as well. They enrich the home indoors and out, after the rest of the garden has fallen before the frosts



When we realize that cosmos, "Black-eyed Susan," the common field daisy and the many cultivated forms are all of the same family, our respect for the hardy chrysanthemum increases greatly

giving more air and exposing to a little direct sunshine each day.

When they are ready to be repotted, they may be put in three and one half- or four-inch pots, placing the ball of roots about two inches below the rim of the pot. If given some liquid feeding, these plants will produce five- to six-inch blooms. They may also be planted direct from the sand into shallow pans, or in five- and six-inch pots, as many plants as are desired. Good plants may be made up in this manner from late June cuttings, putting three to six plants in six or eight-inch pots and stopping them once or twice.

ITS GREAT DECORATIVE VALUE

It is safe to say, without detracting from the beauty and value of any other species of flower, that, during its season of bloom, there is nothing that can compete with the chrysanthemum in rich, massive, gorgeous, decorative value. It can be used anywhere that flowers are required,and for any purpose; and the florist or gardener who has decorative work of any kind to do during the chrysanthemum season is not doing himself

and his patrons justice if he does not use it freely, and, if the circumstances warrant, lavishly. For the simple decoration of the home, plants in six-inch pots grown to single stem and bloom are excellent, placed either singly or in groups of separate colours. Small bush plants are also very pretty placed here and there throughout the halls, library, and reception rooms.

Cut blooms, either large or small according to the size of the apartment, will give a touch of beauty to any place. For bedrooms small or medium-sized blooms should always be used. Large, massive blooms may be used with grand effect in large halls and reception rooms. For the dinner table, whether it is large or small, the blooms may be arranged with infinite variety, and are always attractive if tastefully and effectively arranged. For large tables large blooms may be used, either in tall vases, bringing the blooms above the line of vision, or in low receptacles of various kinds that will allow a flat, but nevertheless beautiful, arrangement; or a combination of the two may be used effectively. For small tables the smaller blooms are more appropriate; in fact, the

large blooms appear incongruous on small tables. The many beautiful varieties of pompons are very desirable for this latter purpose.

It is, however, in decorating large dwellings and churches for weddings, receptions, and other important social functions, and halls and such places of public assembly, that the chrysanthemum is seen in all its glory. Here the plants can be used among great groups of palms and other foliage plants, and large vases of long-stemmed blooms may be displayed with magnificent effect. In addition they may be tied in bunches and festoons over altar and chancel rail, mirrors, doorways, and windows. In fact, they may be used anywhere that flowers can be placed in order to transform the interior into a bower of beauty. When employed in such manner the effect will in most cases leave a lasting impression on the minds of the spectators, and will in all probability strengthen their love for the beautiful as embodied in the form of flowers and plants.

IMPORTING

Many of the best varieties in cultivation at the present time have been imported

from other countries, England, France, and Australia being the sources of practically the entire supply. If it is desired to make importations, the prospective importer must get in communication with dealers or hybridizers in either country and make such negotiations as will secure the desired varieties. The plants are generally dried and weakened by the time occupied in transit, and great care will have to be given them in order to save the little life that is left. They should be unpacked and placed in warm water immediately and allowed to remain there for an hour or more, until the roots have become freshened, when they may be potted, using the smallest pots the roots can be gotten into, and soil composed of one third each of sand, fresh loam, and leaf mould, to which should be added a good sprinkling of charcoal, broken fine. The pots should then be placed in a closed case, plunged in sand, and a gentle bottom heat maintained under them until they have started to grow nicely. While the case should be kept reasonably close, sufficient ventilation must be given to prevent the development of fungi. Very little water

should be given until the plants have started growth and roots, and even then great care must be used in applying it. The plants must be carefully nursed, and constantly watched, until the growth is sufficiently strong to remove as cuttings. Similar treatment may be accorded to desirable varieties that make weak growth.

CHAPTER VIII

Production of New Varieties

Uncertainty of results — Cross-fertilization — Sports, or bud variations

With chrysanthemums, as with every other cultivated plant, the art of creating new, different forms and varieties is rich in fascination and interest. Not only may the results bring us great rewards both æsthetically and financially, but the actual processess of plant breeding carry us into the deep and marvellous realms of Nature's mysteries. My own experience in this line of work having been limited, I am fortunate in being able to present upon this subject the views and the conclusions, after years of practice, of Mr. Elmer D. Smith, one of the most prominent and successful of all American raisers and breeders of chrysanthemums.

Before entering upon the details of this subject let us consider some of the natural conditions which have more or less influence

upon our results. Dame Nature says the chrysanthemum shall be single, and reproduce itself from seed, so in producing these marvellous flowers with almost countless petals we are working in direct opposition to her laws. In some of our improved varieties we are prevented from making further improvements owing to the pistils or styles being abortive; and in others the staminate florets provide little or no pollen.

In cross-fertilization, the operator's desire is to improve the chief characteristics, such as colour, size, form, and fullness. It is beyond all human power to obtain exact results in uniting or mixing the colours of petals. Pollen of a white flower applied to a red may give red, white, or any intermediate shade representing the many varieties of pink. The union of red and yellow gives similar results, producing red, yellow, and all the intermediate shades of brown and tan. We have more assurance when varieties of the same colours are crossed. Improvements in colour can only be attained by bearing in mind the laws of nature in making these unions. The chrysanthemum has a great tendency to revert to its antecedents.

Hence it is that we get many strangers when two of the same colour are crossed. The variety, Mrs. J. J. Glessner, yellow, came from Edward Hatch and Mrs. Jerome Jones, both white or nearly so. This seedling partook of the parentage of Edward Hatch, which was Gloriosum, yellow, and Ada Spaulding, pink. In this connection I would suggest to my reader, and urge the study of, a little book entitled "Mendelism," by Punnett.

Form, size, and fullness are improved only by careful consideration of these qualifications in varieties at our disposal. We are more certain of advancement in the style of growth, securing those which are dwarf and sturdy, by confining our operations to such as possess these qualities. Large and small foliage can be produced by using those having these peculiarities. What governs the potency of the pistillate and staminate parents we cannot determine. We are dealing with minute affairs. The stigma may scarcely have reached maturity when the pollen is applied, or the pollen may have passed its prime with the stigma at the height of development. These varied con-

ditions exert some influence in establishing the character of the seedling.

In selecting varieties for this work the two classes for consideration are those for exhibition and for commercial use. In the former, size is the most important factor, if the other qualifications are up to the average. The commercial grower requires staple colours, and the purer the colour the better. Size, form, fullness, and style of growth are important and should be taken into consideration.

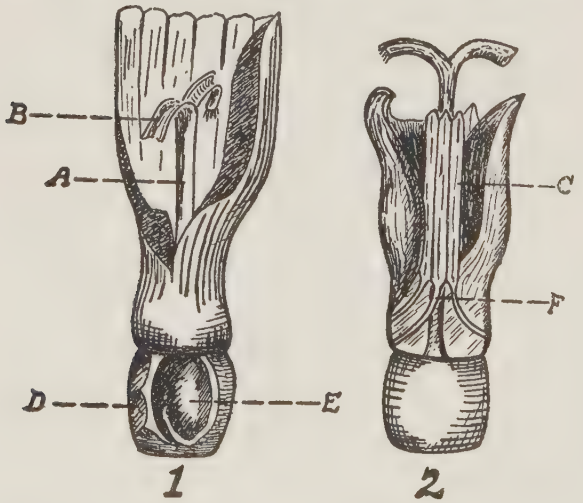
SEED PLANTS

Our experience leads us to believe that single stem plants in four-inch pots, grown naturally without an abundance of nourishment, are best suited for this purpose. They produce fewer ray florets; hence pollen is easier to gather. The styles in flowers thus treated seem to be in better condition, or at least more normal, and produce seed more freely. We have arrived at these deductions by endeavouring to procure seed from plants grown for exhibition, and in nearly every case our efforts have been fruitless. Plants intended for seed raising should be staged in

a dry, light house, and excessive moisture at the roots or in the atmosphere should be avoided.

FERTILIZING OR POLLENIZING

The operation begins when the flowers are half open by cutting the petals off close to



Diagramatic and enlarged ray and disc florets illustrating the parts involved in fertilization. *A* — Style or stalk of pistil: *B* — Stigma or receiving surface of pistil; *C* — Anther or pollen-distributing sac of stamen; *D* — Ovary containing *E* — Ovule or seed; *F* — Filament or stalk of stamen.

the base with a pair of scissors, until the styles are exposed. In the accompanying diagram, which represents enlarged ray and

disc florets, 1 is the petal which furnishes the colour. This is provided with a style or pistil, and when in condition, or fully expanded, is in proper condition to receive the pollen which is applied to the upper surface (*B*), known as the stigma. The disc floret (2) also has a style, but is provided with stamens (*C*), which furnish the pollen. These should be removed from the seed plant with the points of the scissors, to prevent self-fertilization. After the flower head has been trimmed, select the desired flower for pollen. Push aside the ray florets or petals until the disc florets are in view. Collect the dust-like pollen on a camel's hair pencil or toothpick and apply to the stigmas of the flowers previously prepared. This completes the operation. How fertilization takes place is fully described by Prof. Bentley in his "Manual of Botany": "When the pollen falls upon the stigma its intine protudes through one or more pores of the extine in the form of a delicate tube which penetrates through the cells of the stigma, by the viscid secretions of which it is nourished. These pollen tubes continue to elongate by growth and pass down the con-

ducting tissue of the canal of the style, and thus reach the ovary, where the seed is formed."

If a toothpick is employed never use it for more than one kind of pollen. By allowing the camel's hair pencil to stand in an open-mouthed vial of alcohol for a few moments after using, it may, when dry, be used upon another variety without danger of the former operation affecting the present one. Pollenizing should be done on bright, sunny days, as far as possible. In wet weather a dry, warm house can be utilized, and the work continued each day, provided sufficient pollen is at hand. On bright days pollen is generally very abundant, and may be collected, stored in vials, and labelled ready for use. If kept perfectly dry, this pollen will retain its vitality throughout the chrysanthemum season. After fertilization give the plants only sufficient water to keep them from wilting. Always keep a record of the work, showing the parents of the seedlings. It will afford pleasure to know how a meritorious variety was produced, and may suggest possibilities along other lines.

Seeds ripen in five or six weeks. Plants fertilized early in the season give the greatest

number of seeds, due, doubtless, to more favourable weather at that time. Do not anticipate superabundance of seed. The crosses which give but few seeds generally produce the best seedlings. Hand-pollenized seeds are of more value than those naturally pollenized by the wind or insects. It at least seems rational to expect more from seed secured by the union of our best kinds than from that produced by the wind without intent, or the bee, whose only object is to secure her daily sustenance. If this be true, the results of our work depend upon the degree of intelligence employed in the selection of parents and the thoroughness with which the accomplishment of every detail is attended.

SEEDLINGS

The seeds should be sown as soon as they are ripe, using pots, pans, or shallow boxes. They should be covered lightly and kept in a temperature of about 60 degrees until they have germinated. If kept in so high a temperature the seedlings are quite likely to damp off; at the first indication of such a condition move them to a more airy place.

As soon as they have made their second pair of characteristic leaves, prick them off into shallow boxes, about an inch apart. When they show signs of crowding they should be potted separately and repotted as often as necessary or planted into the bench, the same as in the case of ordinary plants that have been grown from cuttings. They will flower the first year from seed, and there is nothing more interesting than to look over a large lot of seedlings and note the diversity of form and colour. After the planted seedlings are established, nip out the tops and allow two breaks to come up and flower, and, as far as possible, select a crown or early bud on one of these, and terminal or late bud on the other; thus we gain some knowledge at the very first year as to which bud produces the better flower. Those that are considered desirable may be saved and given further trial.

SPORTS

The word "sport" in connection with chrysanthemums refers to varieties that originate from bud varieties. (By "bud varieties" is meant that one or more buds, generally only one, of a certain variety may

produce a flower of a different colour, as a bud of a white variety producing a pink or yellow flower.) Occasionally a variety will sport the first or second year after its origin from seed, but generally it does not take place until several years have elapsed, and then often simultaneously in remote localities. This has occurred in this country, the most marked case being that of Mrs. Jerome Jones sporting to yellow.

It need not surprise any one cultivating chrysanthemums to notice a plant producing flowers of two distinct colours. Sometimes the sport flowers will be one half the original colour (the flower being of two colours), and again possibly another bloom will be of the new colour entire. It has been reported that plants sometimes sport in form—that is, give a flower of entirely different form from that originally possessed, such as an incurved variety sporting to a reflexed form. Such cases are, at least, few and far between. In fact, we are inclined to disbelieve that such changes have really taken place. Cultural conditions often change the form of flowers materially, and also the kind of bud selected; doubtless

some of the cases reported were due simply to these causes.

To perpetuate the new colour of the plant that has sported, the method generally followed is to cut out the leaf on the flowering wood with a heel or portion of the stem, and place these under a bell-glass or closed frame to induce them to make roots, after which they send forth new growth. These are planted the next season, and if any possess the original colour they are discarded and those of the new colour saved. Generally in the course of two or three seasons it is safe to consider the new variety established and the colour, as it is termed, fixed.

HOW SEEDLINGS ARE JUDGED

The Chrysanthemum Society of America each year appoints committees, composed of three expert judges of chrysanthemums, to meet in the more important, prominent cities of the country, on appointed dates, notice of such meetings being given in all the weekly floricultural publications, to pass judgment upon any seedlings, sports, or new importations that may be brought before them. The decisions of these committees

are also published, and the results are placed on record with the secretary of the organization. The society has adopted scales of points for the guidance of these committees in determining the value of the different classes of blooms. The official scales of the C.S.A. are as follows:

For commercial purposes.	Points
Colour	20
Form	15
Fullness	10
Stem	15
Foliage	15
Substance	15
Size	10
Total	100

For exhibition purposes.	Points
Colour	10
Stem	5
Foliage	5
Fullness	15
Form	15
Depth	15
Size	35
Total	100

CHAPTER IX

Insects, Diseases, and Remedies

Aphides — Red Spider — Grasshoppers — Caterpillars —Leaf-spot — Mildew — Rust

While the chrysanthemum is subject to the depredations of several species of insects and fungi, fortunately there is none that may not be overcome without serious injury to the plants if the grower will give vigilant attention to the matter, and use such preventive and destructive measures as are available.

The most common, pernicious, and persistent insect enemy is the green aphis. The black aphis is also quite common, but is easily destroyed by the means recommended for the green aphis. This latter species works its way into the folds of the young leaves as they are developing, and is with difficulty reached with either liquids or fumes, without injury to the young growth. The grower must be constantly

Minnie Bailey

Black Hawk

TWO OF THE MANY-FLOWERED POMPONS

Pompons are always graceful and have the added advantage of being adapted to either greenhouse, dwelling or garden cultivation

The greatly developed disc-florets give the large-flowered anemones a unique and pleasing appearance. Variety, Ada Strickland

THE POMPON AND ANEMONE TYPES

on the watch for this insect, and must be persistent in using means to destroy it, as it will soon do serious harm to the young growth. Fumigating with tobacco stems has until recently been the orthodox remedy, and is still used to considerable extent. The stems must be kept moist while being burned to prevent them from being consumed too rapidly; otherwise the plants are likely to be damaged. The fumigating is better for being done in the evening and, if possible, when the weather is cool. Just how heavy the fumigation should be can be determined only by experience; but the beginner may soon learn how much to apply by giving the plants a fumigation three nights in succession, making the smoke quite thin, so that objects can be seen across the house the first time, increasing the amount the second night, and, if the aphis is not destroyed, increasing still more the third evening.

Of recent years there have been placed on the market by different manufacturers various preparations of nicotine, which are more convenient and pleasant to use, although probably somewhat more expensive.

Directions for its use accompanies each of them. Dusting the points of the plants, while wet, with tobacco dust is an effective remedy. This also should be applied at night or during cloudy days, and should be washed off with the hose and spray after a few hours. Various liquid insecticides may be used by spraying the plants with them. Special efforts should be made to eradicate this insect entirely at the time that the buds are forming, as if any of them are on the plants then they will work under the scales of the buds and eventually into the blooms, which will surely be ruined.

Red spider is an enemy for the existence of which on chrysanthemum plants there can be no excuse, provided a supply of water is available and the means to apply it to the under side of the leaves with reasonable force. This is the best remedy of all for this insect, and, as the chrysanthemum makes its growth at a season of the year when water can be used freely, should prove an effective remedy. As with the aphis, pains should be taken to have the plants absolutely free from spider before the buds

begin to open, as then syringing must be discontinued, and if any of the insects are lurking on the plants they will soon spread to the blooms, with disastrous results. In case the plants should become badly infested with spider, or if there is any appearance of its existence on the plants just before the buds begin to open, they should be thoroughly sprayed on both sides of the leaves with a solution of whale-oil soap. One pound of soap should be dissolved in one or two gallons of boiling water. When thoroughly dissolved, dilute to make ten gallons of solution. Ivory soap may be used in the same manner if preferable, or any of the manufactured insecticides that are on the market employed according to directions. The spraying must be thoroughly done.

THRIPS, GRASSHOPPERS, AND CATERPILLARS

Thrips are sometimes quite troublesome, but the fumigations for aphides and the syringings for red spider will generally destroy them. Grasshoppers frequently find their way into the houses in considerable numbers, and do serious damage by eating off the points of the growing shoots. Catch-

ing and destroying them is the only remedy. Several species of butterflies and moths lay eggs on the leaves of the chrysanthemum, and the young caterpillars do considerable damage to the foliage. They rarely become serious, however, and picking them off by hand will generally be sufficient. Should they become serious, the leaves may be sprayed with arsenate of lead in solution at the rate of one ounce to three gallons of water.

THE TARNISHED PLANT BUG

Where chrysanthemums are grown out of doors this insect becomes a serious pest. Probably the first indication of its presence will be the wilting of the young leaves at the growing tips of the shoots. Upon examination they will appear to be covered with small, brownish spots, and the stems will show the same appearance. If careful search is made a small, flat bug of greenish or brownish-yellow colour will be seen dodging about the plants in an effort to keep out of sight. The adult is brownish-yellow, and will probably fly away if disturbed. The young bugs are greenish-yellow, and are unable to fly. They are difficult to catch,

however, as they jump about very quickly. They injure the plants by puncturing the young leaves and stems and sucking the juices, the spots being caused by this action. Often the entire point of the shoot will be checked, causing it to go blind. A thorough spraying with whale-oil soap solution, of the strength recommended for red spider, will destroy the young bugs and tend to drive away the old ones. If the plants are in a compact mass, or near some building, they may be covered with mosquito netting to prevent the bugs from getting at them.

CHRYSANTHEMUM BEE-FLY

What is known as the chrysanthemum bee-fly makes its appearance in the autumn about the time that the flowers of the chrysanthemums are fully open, and feeds from the pollen of the flowers. This has a very decided resemblance to the common black honey bee, hence its name. It does no harm beyond soiling a few of the petals.

FUNGOUS DISEASES

Leaf-spot is a disease that attacks the older foliage of the plants and causes serious

injury when allowed to spread. This disease is generally induced by unhealthy conditions surrounding the plants, or some constitutional weakness of the plants themselves. If the plants are kept too wet during cold, cloudy weather, and at night, or if weakened by growing in a close atmosphere without sufficient ventilation, the disease is likely to attack them. Strong-growing varieties that are given proper treatment are rarely attacked. Hence preventive measures are the most effective means of combating the disease. Various fungicides have been advocated by different growers as remedies for this, as well as for the rust, each grower, perhaps, recommending a different remedy, just as many cures are offered for the same human ill. I am fully convinced that good cultural methods, combined with rigid selection of stock for propagating purposes, are the most effective means of keeping plants of any kind in good health; just as healthy breeding, good sanitary and hygienic conditions, combined with intelligent diet and exercise, are the best means of preventing disease of the human race.

That scientific research tends to confirm the truth of this conclusion is evinced by extracts from a paper read before the members of the Chrysanthemum Society of America at the convention held in New York City, November 11, 1903, by Professor George E. Stone, of the Hatch Experiment Station, Massachusetts. "Most growers," he says, "are familiar with the chrysanthemum rust, although I have no doubt that some of you have had no personal experience with it. The rust occurs as small blisters, usually on the under side of the leaves. These blisters eventually break open, exposing a brownish, powdery mass. This powdery substance constitutes the uredospores, which are the only spores known to be produced by this fungus in this country. The first appearance of the chrysanthemum rust in America, so far as is known, occurred in Massachusetts during the fall of 1896. . . . The first two or three years of the outbreak in this country proved the worst, and at present little is heard of it in the East, especially from our largest and most efficient growers. Its disappearance appears to be due to two causes — namely, the discovery

and application of cultural methods which render infection less common, and the limitation of the fungus to a single stage (uredo) of existence. . . . That cultural methods have had a great deal to do with the disappearance of the rust is evident from the fact that our most skilful growers of chrysanthemums have never had it but one or two years, and some not at all; while less skilful and less painstaking growers have been more or less subject to it every year. From the first, we have never apprehended any very serious trouble from the rust, because we believed that some cultural methods would be devised that would render it less troublesome. . . . Most gardeners agree that weak stock is the most susceptible to rust; and if weak, infected plants are allowed to remain in close proximity to strong, healthy ones, the latter will subsequently become infected. The method of preventing rust consists of hand-picking the infected leaves, selecting clean, strong stock, discarding susceptible varieties, and inside culture. If these suggestions are carried out, the rust can be practically eliminated. In regard to inside culture during the sum-

mer, we find that many excellent growers lay much stress on this practice, and from our observation we consider it very essential in order to obtain plants free from rust. The reason that inside culture results in less infection is due to the avoidance of mists and dews on the foliage, thus furnishing less favourable opportunity for rust spores to germinate and cause infection. Care should also be taken to keep all unnecessary water off the foliage in cultivation in the greenhouse. Most growers are unanimous in considering the chrysanthemum rust of little consequence and others look upon it as a thing of the past. There are a few, however, who have not succeeded in subduing it and who still think it a serious disease. Some have resorted to spraying, with results that amount to little more than suppression. It appears from our own observations as well as from those obtained from the most successful growers of this plant, that the proper remedy lies in the judicious selection of healthy, rust-free stock, and inside cultivation. Give the plants plenty of air and keep the soil in good physical condition. If, however, any of the leaves become infected,

they should be removed and burned immediately, and if a plant becomes badly infected it should be burned. In whatever manner the plants are cultivated, whether indoors or outdoors, endeavour to keep the dew and moisture off the foliage as much as possible."

This last admonition by Professor Stone, while being excellent advice upon the subject in question, needs to be qualified. It is, in fact, incompatible with the instructions given for the prevention and eradication of insects, unless qualified. Water may be used freely upon the foliage of the plants, provided that the soil is not kept saturated at any time and the foliage is perfectly dry before sunset each day, and during cloudy and wet weather. The soil should also be kept reasonably dry during periods of cold, cloudy, and rainy weather. If these conditions are maintained, water may be used liberally on the foliage without danger of inducing fungous diseases, for in our climate a liberal use of water on the foliage is absolutely necessary to the development of good chrysanthemums. With a thorough understanding of the matter, the advice of Professor Stone is excellent, and entirely consistent with good practice.

There is another fungous disease that causes the lower leaves of the plants to die and eventually the entire plant to dwindle and perish. This is called stem-rot, from the fact that the fungus attacks the stem and destroys the tissues or ducts, thus preventing the water from ascending and carrying the necessary nourishment for the proper development of the plant. This disease is comparatively rare. The fungus apparently enters the plants from the soil. The only remedy is the destruction of affected plants and as this, like the other diseases noted, seldom attacks strong-growing, healthy plants, the same management applies.

Powdery mildew of the chrysanthemum is the most common of all fungous diseases, and will attack healthy plants in greater or less degree, if conditions congenial to its development are allowed to exist. Sudden changes of temperature, combined with excessive moisture either in the soil or atmosphere, will, in all probability, induce an attack. Here again cultural care is the most effective preventive. While the temperature of the chrysanthemum house may go as low as 40

degrees at night or even lower when the flowers are opening, the atmosphere must be dry and the temperature lowered gradually and there must be sufficient artificial heat combined with ventilation to keep a reasonably free circulation of air through the house. Sulphur dusted through the house during the heat of the day, or a mixture of lime and sulphur in the form of paste spread on the heating pipes and sufficient heat applied to disperse the fumes, will aid in preventing and controlling the disease. If badly affected, the plants may be sprayed with a solution of liver of sulphur, one ounce to two gallons of water, care being taken that none of the solution comes in contact with opening flowers. The only other liquid fungicide that can be used without discolouring the foliage is the ammoniacal copper carbonate solution. This is prepared as follows, the formula being that given in Lodeman's "The Spraying of Plants":

Copper carbonate	3 oz.
Ammonia (22° Beaumé)	1 qt

Agitate until the copper is completely dissolved

Use in proportion of one part to one hundred parts water. Bordeaux mixture may

HARDY ANEMONES

When is the end of the season for chrysanthemums? This photograph was taken October 25, after several hard frosts.

PROTECTING AND SHADING PLANTS

The garden chrysanthemum is distinct from the greenhouse type chiefly in that it is developed as a many flowered bush. It is much the hardier, but still appreciates some shelter from winds, cold and intense sunlight

be used early in the season, but it discolours the foliage badly.

A writer in the *Journal of Horticulture* (Eng.) gives the following: "If mildew attacks chrysanthemums — and August is the great month for it to appear — prompt measures must be taken. For this purpose, half a pound each of sulphur, soft soap, soot, and lime should be boiled for half an hour in a gallon of water, and, while it is still warm, half a pint of paraffin should be stirred into it. When cold, the liquid should be drawn off clear and bottled. It will keep indefinitely. When wanted for use, a quarter of a pint should be diluted with a gallon of water and the solution applied to the leaves — the under side especially — by means of a syringe or knapsack sprayer. It is a mistake to wait for an outbreak of disease before using the solution. Its value as a preventive is far greater than as a remedy, and many experienced growers apply it once a fortnight from the beginning of July onward. Mr. Wells says that if it is used as a preventive for fungus, mildew will not make its appearance at all. It will also keep at a distance a fly which attacks chrys-

anthemums, depositing its eggs in the leaves, which the maggots afterward disfigure and destroy by boring up and down inside."

CHAPTER X

Growing in the South

Chrysanthemums outdoors in New Orleans—Cultural hints month by month

"As soon as the young plants are well rooted in small pots," says C. W. Eichling in the New Orleans *Picayune*, "they should be shifted into three-inch pots, using a rich soil to induce a healthy growth and prepare them for the open ground, into which they should be planted about the end of April. The cuttings are made from January to the end of March, according to the early and late blooming varieties. Some that are wanted for Christmas flowers may be propagated in the open ground under slatted shed or canvas in July and August. In New Orleans our most valuable crop is taken off on All Saints' Day, November 1st. The beds in which the chrysanthemums are to be grown should be made of rich soil, high, and well drained. A heavy loam, with a liberal mix-

ture of cow manure and bone meal, suits them better than light, sandy soil. The plants are set out in beds, in rows one foot apart, and six inches between the plants. As we do not desire more than two flowers per plant, this distance will allow the flowers to attain a diameter of six inches without rubbing each other. We allow three feet between the beds, to permit free passage and easy cultivation. After planting, give a good watering. As the plants are set out from pots they will need no shading. When the plants are about one foot high we pinch the tops off the strongest growing ones, which causes them to make several shoots, of which we allow the strongest two to grow. The selection of these shoots must be made as soon as they are an inch or two long, to avoid a waste of growth in unnecessary shoots. The weaker plants are never topped, developing but one flower apiece. The question whether it pays to grow one large flower per plant, or three or more smaller ones, depends largely on the demand in different localities. The only insect enemy that the chrysanthemum has is the green and black aphis, or fly, which can be kept down by a

liberal application of tobacco stems and dust.

"It is now time to stake and tie the plants as they grow, in order to protect them from injury by the wind and to keep the branches straight. We drive a stake at each end of a row and stretch three rows of No. 16 wire, the first about a foot from the ground, the second about two feet, and a third as near the flower as possible, to keep the stem from breaking. From the time the plants are set out until the flowers are cut the chrysanthemums must not be allowed to get dry, and as long as drainage is perfect there is little danger of over-watering, except during the last stages of perfecting the flowers, when water should be given rather sparingly. If the soil was well prepared and enriched before planting, additional fertilizing or feeding will be unnecessary until the buds are formed and selected. In this region crown buds rarely bring perfect flowers, and should not be selected. The terminal buds perfect the best flowers. It is supposed that by this time the plants, which are gross feeders, have exhausted the plant food contained in the soil, and in order to obtain as large a

flower as possible we give the plants twice a week a watering with cow manure of about the concentration of weak tea. Toward the end of September the early varieties will show colour. From this time on, feeding must be stopped, only clear water being given, and the quantity gradually reduced until the flower is perfected. The opening petals are very delicate and waxy; all contact between blooms must be avoided. For this purpose we build a shed over them and cover it with canvas; or, still better, with glass, to keep the rain and dew from falling on them and to protect them from the hot sun's rays, which easily burn them."

CHAPTER XI

The Pompon Chrysanthemum

Experience of an amateur with the old-fashioned type — Hardiness of pompons — Their decorative value and ease of culture

The following experience of an amateur covers so thoroughly the culture of the garden's last dependable flower of the season that it is made a chapter by itself.

"The pompon chrysanthemum rewards the grower better than most flowers, as it is that rare thing, a hardy autumn plant, keeping in bloom for a month after almost everything else has gone, and able with its masses of blossoms to maintain a gay looking garden.

"Whenever I see the strange shapes of the odd chrysanthemums on which the professionals so pride themselves, and whenever I note how quickly those queer flowers fade, I think with satisfaction of my own unpretentious but prolific plantation. Not one flower to a stem, but often more than fifty;

not tender to frost, but hardy; not soon fading in the house, but usually keeping more than a fortnight; regular in shape, beautiful in colour, requiring no skill to grow, no investment, and no great care.

"I am ready to admit that there is beauty in many of the large-flowering chrysanthemums, but when I think of the care needed in growing them, as well as in keeping them after they are cut, and consider how little time the average home-gardener and house-keeper can give to both these, I make my decision in favor of the less showy but more cheaply and more easily grown kinds.

THE INCREASE OF SEVEN YEARS

"I started seven years ago with perhaps a dozen small plants of two varieties, red and yellow. The yellow kind has done better than the red, and it now makes a row about twenty-two feet long, while the red ones fill only sixteen feet. Yet that is doing very well, considering three complete transplantings, the many roots given away, and the fact that not until recently have the plants had really good earth. Having been

told that they would 'live anywhere,' and being an ignorant rather than a careless cultivator, I did not realize, until I tried it, the difference between living upon scant rations and flourishing upon plenty. There are now so many new plants springing from the roots that in another year I shall be able to nearly double each row.

"Though they are an old-fashioned plant, and somewhat neglected just now, they are offered by seedsmen and nurserymen, who carry (according to their catalogues), some as few as four, one as many as forty-seven, named varieties, and one offers the seed.

"They have the same shaped characteristic leaves as the show flowers, but are smaller, and bear their own small, symmetrical, more or less double flowers, in great profusion. The blossoms vary in size with the varieties, my small reds being seldom more than an inch across, while the yellows are two inches; and I have seen other varieties whose flowers were as much as two and a half inches in diameter. It is possible to produce larger flowers by disbudding and growing only a few to a stem, but this requires more time

and trouble than I have been able to give to them.

POMPONS AS A SCREEN

"I use these hardy chrysanthemums to screen my piazza lattice, which is never truly handsome, and which, as the summer advances, they cover to perfection, even to the height of four and a half feet. As they grow they require support, for, although the red ones are very stiff, they bend in wind or rain; the yellows droop naturally. We support them with light bamboos tied across the rows; the uncompromising reds reveal their support, but the yellows completely cover theirs.

"As a low screen they are therefore perfect, and give besides, a good background for the flowers which stand in front of them. I know of no plant which I would exchange for them for this purpose.

FLOWERS IN A FROST-DESOLATED LANDSCAPE

"The pompon chrysanthemums become really valuable about the time when other plants give up the fight. I have the ill-fortune to live where my flowers get frost

earlier and harder than my near neighbours. It is a particular satisfaction, therefore, to have my chrysanthemums come into bloom about the time that everything else is killed. My sneeze weed and sweet alyssum were the only flowers left to me, except some very feeble stocks, when the chrysanthemums were large enough to pick last year, and even those were soon gone. Last fall the first killing frost came September 27th; the frosts came almost nightly after the first week in October; the flowers were in bloom, large enough to pick, on October 12th, and gave a constant supply from that time on. The last picking was on November 12th, the plants having twice gone through frosts of eighteen degrees; but for some time longer the flowers were effective when seen from a distance, although too much injured to look well at close quarters in the house.

"As cut flowers some of the bunches lasted three weeks; but after they had suffered from many frosts they lasted less than a week.

HOW TO GET MORE FLOWERS

"The pompon chrysanthemums are easily increased by division of the roots. Each

spring the old plant sends out numerous new shoots, called suckers, which, if taken from the old plant, with a few roots if possible, will make blooming plants the following fall. Should the suckers not have roots they should be put in a pot or box of sand, and given the same treatment which is given to the ordinary 'slip,' or cutting. These suckers will produce new roots very quickly. When the plants become large they can be divided in the spring by cutting them with a spade into two or more pieces.

"If young plants are not wanted the suckers should be removed, or else the plants will stand too closely. Grown as ours are for a screen, we let them stand at two to three inches apart, and feed them heavily. Their roots are shallow, therefore they must be cultivated carefully. It is a good plan to mulch with lawn clippings. So far, with us, they have had no pests or diseases, a small black plant-louse which comes in the middle of summer always disappearing without doing any harm. They should be watered while in flower, if the ground is at all dry.

"Protection of the plants is a very simple matter, grown as ours are. Twice their

buds, while very young, have been killed by unexpected early, heavy frosts, against which we did not guard; but once in bloom both flowers and buds seem to be able to stand almost anything. However, I cover ours at night with cotton cloths which are attached to the bottom of the piazza railing, and folded back by day. In winter the only protection is their own tops, cut off and laid over the roots. Thinning, fertilizing, mulching, supporting, covering against frosts, and breaking down the tops in fall are all the care needed for plants that yield us more flowers than any others.

"There are two classes of hardy chrysanthemums which may be had—the Japanese and the pompons. The latter are usually far more satisfactory, as they are much hardier, yet it is possible to grow out of doors excellent flowers of the Japanese sorts four, five, and even six inches in diameter. There is nothing else in the garden just like these pompon chrysanthemums. Their colours are very vivid, and harmonize with nothing else, and because of their striking appearance it is better to grow them in masses by themselves.

"The range of colour among the pompons

is as great as in their larger relatives, the house chrysanthemums; and, for one who has not the advantage of a glass structure in which to grow the larger kinds, all the pleasure which they bring can be had in these smaller and hardier varieties."

CHAPTER XII

Cultural Hints Month by Month

January—About the first of the month put in cuttings of all varieties that are to be grown as specimen bush plants or standards. About the 20th to 25th put in another lot for the same purpose. Plants intended for sale from two and one half inch pots during February should be propagated as fast as the cuttings can be secured. Stock plants must be got into growth toward the end of the month that we may secure cuttings for plants for March sales. Pot all cuttings as soon as ready. Order such novelties as are intended for trial during the season.

February—Pot all cuttings as soon as well rooted. Plants that were propagated during December and January, intended for specimen bush plants, must be stopped as soon as they are two to three inches high. They should also be repotted into four-inch pots. Put in the last lot of cuttings for

specimen bush plants and standards about the 20th of the month. Give stock plants good care, particularly abundant ventilation. Put in cuttings for plants for March sales. Plants that are being shipped must be well packed and protected from cold.

March —Early propagated bush plants and standards will be ready for repotting into six-inch, the second lot into four-inch pots. Keep all bush plants stopped as required. Cuttings in propagating beds will need careful attention as to shading and an abundance of water. Stock plants should have all the ventilation possible during bright sunny days, to induce stocky, healthy cuttings for April propagating. Propagate for sales as required. If soil for general potting and planting was not secured in the fall it must be got as soon as possible.

April —Repot early bush plants into eight-inch, second lot into six-inch, and last lot into four-inch pots. Begin tying down branches of bush plants to obtain desired form. Stop standards to form head. Propagate plants intended for specimen cut blooms for exhibition from the 1st to the 15th; also early varieties for cut

blooms for market, and for small bush plants for market during the last half of the month. Turn and mix the compost intended for potting and planting. Plant hardy varieties outdoors.

May —Repot early bush plants into flowering pots; later ones into six- and eight-inch pots as required. Give careful attention to stopping and tying bush plants and standards. Pot all cuttings as soon as ready. Propagate plants for principal crop of cut blooms for market, for six-inch pot plants, and plants for decorative purposes. Plant all varieties intended for exhibition blooms. Plant all varieties outdoors that are to be grown there.

June —Pot all bush plants and standards into their flowering pots. Attend to stopping and tying. Syringe freely. Give all ventilation possible. Get benches filled with soil, and set plants for principal crop of cut blooms planted. Propagate late varieties for cut blooms.

July —Discontinue stopping bush plants after the 7th of the month. Keep surface of soil in benches stirred. Put supports to all plants to be grown for cut blooms.

Remove laterals from early planted stock. Syringe all plants freely. Keep houses cool, and give all ventilation possible. Begin feeding early-planted stock and bush plants, if in condition for taking food. Plant late varieties for cut blooms. Put supports to bush plants to prevent branches breaking. Put supports to all plants outdoors that require supporting. Give plants outdoors abundance of water.

August—Feed all plants that are in a healthy condition. Remove laterals. Look out for crown buds of early varieties. Keep all plants tied to supports, and stems straight. Look out for crown buds of all varieties after the 20th. Disbud. Lift and pot any plants that have been grown in borders or benches for small bush plants. Keep plants that are planted outdoors thoroughly watered. Give them a mulching of good manure.

September —Taking buds, disbudding, tying, feeding, watering, and syringing are all important now. See that all plants are free from insects, and that they are reasonably dry at night. Arrange for marketing cut blooms. Decide what will be

sent to exhibitions and where. Put up supports for protecting early flowering varieties that are to flower outdoors.

October —Disbudding will require almost constant attention. Begin tying out bush plants and standards. Early varieties will be ready for use and should be disposed of. Discontinue feeding red-coloured varieties. Give abundant ventilation at all times. Put some heat in the pipes during cold, wet weather. Look out for damping of flowers. Grade flowers that are to go to market, pack them carefully, and be prompt in making shipments. Exhibitions will be held and exhibition blooms should be looked after carefully, storing any that are developed too early. Put the finish to bush plants. Note varieties as to time of development, character, and colour. Make a display of plants and blooms that are for sale. Select and label healthy plants that have produced good blooms for stock plants, before the blooms are cut. Protect blooms that have been grown outdoors.

November —Blooms that are to be held for exhibition or other purposes should be stored just before they are quite finished.

Market plants should be sold before they are fully finished, if possible. Select plants that are perfect. Store all stock plants as fast as the blooms are cut. Collect and stack soil and manure for next year's supply. Lift and store all stock that has been grown outdoors.

December —Remove all stock from the beds and benches as soon as possible, to allow the space to be used for other purposes. See that frost does not penetrate the storage room, and admit all the light possible to keep the foliage of stored stock in good condition. Begin propagating for specimen bush plants and standards and for early sales.

CHAPTER XIII

Types and Varieties

Distinctive characteristics — The most popular types —Types desirable for various purposes —Early, mid-season, and late varieties for special purposes

The history of the origin of the types of chrysanthemum in cultivation at the present time is obscure, and certainly is not essential to their successful cultivation. They have all been produced by blending two distinct species, *Chrysanthemum Indicum* and *Chrysanthemum morifolium*, or *Sinensis*, as it is commonly known. They belong to the botanical order of Compositæ, the true flowers of which are very small, tubular shaped, and, arranged closely together, forming a head which is surrounded by a circle of petals or florets, called rays.

THE SINGLE TYPE

The small, single type appears to be nearest to the form of the original parents.

These produce flowers from one to two inches across, having a yellow centre composed of the normal, perfect flowers, or florets, as they are called. While not always strictly single, they all have the effect of being so, and are so styled. The large single forms are similar to the small, but have flowers from four to five inches across.

THE ANEMONE TYPE

These are somewhat similar to the single type, but instead of the centre being composed of normal florets, the tubes of the florets are elongated, quilled, and enlarged at the ends, producing a high, rounded centre. The small anemones, known as "pompon anemones," have flowers about two inches across, with straight, short ray florets. Like the true pompons, they are quite hardy and may be grown outdoors. The large anemones are similar to the pompon anemones, but larger, the flowers being three to four inches across. The Japanese anemones are quite large, from four to six inches across, and irregular in form, the ray florets often being quite numerous and the

A rosy terra-cotta variety. Mrs. John E. Dunne. Probably from a crown bud

Dr. Enguehard, one of the best pink varieties. Obviously a terminal flower

THE REFLEXED AND INCURVED TYPES

Leila Filkins, a pink variety of the "Japanese reflexed" type. Each petal seems to have a direction of its own

The characteristic of the typical "Japanese" type is the shaggy, unkempt bloom. Nellie Pocket, a white variety

TWO BLOOMS OF THE JAPANESE TYPE

rays long, twisted, curled, and drooping, producing singular and sometimes very beautiful effects.

THE POMPON TYPE

The pompons have small blooms, some of them being not more than one half inch across. The growth is never more than three feet high, the leaves are small, and the stems stiff and wiry. They will live out of doors with very slight protection in most parts of the United States.

THE INCURVED TYPE

The flowers are regular in outline, globular, with the florets regularly and smoothly arranged. Any unevenness is considered a defect. Consequently the flowers of the true incurved type are very formal.

THE REFLEXED TYPE

The flowers of this type are more or less hemispheroidal, having the bloom well filled with florets growing outward and downward and full at the centre.

THE HAIRY TYPE

The flowers of this type are generally

small to medium size, incurving, the reverse of the florets having more or less glandular, hair-like growth on the surface.

THE JAPANESE TYPE

In this type are placed all the irregular, fantastic, and beautiful forms that cannot be included in any of the previously specified groups. The greater number of the varieties grown in the United States must be included in this type. With few exceptions, the other types are not popular here. The large, informal Japanese varieties are very popular. The little pompons rank next to them in popularity. At one time the hairy type created somewhat of a sensation, but since the novelty has worn off they are rarely grown, except occasionally as a curiosity.

SELECTIONS OF VARIETIES

In making selections of varieties for any purpose it will be wise to include only the very best forms in each class of colour. New varieties are constantly being originated and introduced, and as soon as one proves superior to any existing variety of

the same colour, the older one is relegated to obscurity. Thus the lists of varieties in cultivation are constantly changing. Very few varieties remain in cultivation for a decade; many, of course, not more than a year or two. In making selections for the various purposes specified hereafter only those that are considered the best in their respective colours, with a liberal allowance for individual preference or varying circumstances, have been named.

SINGLE VARIETIES

Like the pompons, these are growing more popular each year. They may be used with good effects as pot plants, singly or in plant decorations. As cut flowers, they may be used for many purposes where the large-flowered varieties would be inappropriate. Many new and beautiful varieties have been originated recently.

Amber Queen, dwarf habit.
Argenta, dwarf, pure white.
Arlee, golden amber.
Belle of Weybridge, terra cotta.
F. W. Smith, rich pink.
Gracie Lambert, deep rose pink.
J. T. Angus, rosy cerise, late.
Katie Covell, maroon.
Kitty Bourne, soft golden yellow
Lady Lu, large, pure white, vigorous grower.

Ladysmith, pink, early, first class.
Mizpah, purplish-rose, dwarf.
Merstham Jewel, terra cotta and gold.
Reginald Godfrey, yellow.
Rev. W. E. Renfray, rich crimson maroon.

POMPONS AND POMPON ANEMONES

These are hardy, and desirable for planting outdoors, also for growing as small bush plants, for using in plant decorations, and for cutting, as sprays of many of the varieties are very beautiful.

WHITE
Angelique, early, graceful habit.
Baby Margaret, one of the most popular.
Emily Roebottom, pompon anemone.
La Pureté, early, stiff stem, good for cutting.
Maid of Kent, an old and good variety.
Mildred, pompon anemone, blush edge to petals.
Queen of Whites, creamy white, good.
Elva, magnificent, pure white, early, one of the best.

PINK
Autumn Queen, an old and good variety.
Blenheim, magnificent pure pink.
Danizula, soft pink, good.
Grace Darling, pompon anemone.
La Paranace, delicate pink, one of the best.
Rose Marguerite, dark rosy cerise, late.
Rosanthe, rose, good.
Alma, deep pink, one of the best.

YELLOW
Donkelarii, rich golden yellow.
Eagle d'Or, pompon anemone, pleasing flower.
Elberta, very good, deep yellow.
Golden Circle, early.
Golden Trevenna, small flowers, profuse bloomer.
Zenobia, early, rich deep yellow.
Klondike, brilliant yellow, compact bloom.
Ila, bright yellow, fimbriated petals, one of the very best.

OTHER COLOURS

Attila, orange maroon, excellent.
Brown Bessie, small flower but rich colour.
Canova, deep orange bronze, very rich.
Captivation, small reddish pink.
Julia Lagravere, the best dark red.
Little Pet, rich violet red.
Little Bob, red, early and free.
Little Dot, mahogany, profuse bloomer.
Manilla, pompon anemone, deep cardinal red, yellow centre.
Santiago, bronze red.
Stratagem, dark orange red.
Ingo, crimson mahogany, a splendid variety.
Skibo, fine bronze.

VARIETIES FOR SMALL BUSH PLANTS FOR HOME USE OR MARKET

Selected because of reasonably dwarf habit, vigorous, healthy growth, with stems that require but little if any staking and tying. Abbreviations: Inc., incurved; Jap. inc., Japanese incurved; Ref., reflexed; Jap. ref., Japanese reflexed; Jap., Japanese; An., Anemone.

A. J. Balfour, bright rosy pink, Jap.
Brutus, orange bronze, Jap ref.
Carrie, bright yellow, early, Jap.
Dr. Enguehard, pink, Jap. inc.
F. A. Cobbold, mauve pink, Jap.
Garza, white, An.
George W. Childs, crimson, Jap.
Glory of the Pacific, pink, early, Jap.
Ivory, white, Jap. inc. An old variety, but one of the very best in cultivation for this purpose.
John Shrimpton, crimson, ref.
Lady Lydia, white, Jap.
Midge, white, Jap., very dwarf.
Miss Alice Dalskov, light pink, sport from Ivory.

Miss Clay Frick, white, sport from William Duckham, Jap. inc.
Mizpah, single, bright purplish rose.
Monrovia, yellow, early, Jap.
Polly Rose, white, sport from Glory of the Pacific.
R. Hooper Pearson, very rich yellow, Jap. inc.
W. H. Lincoln, yellow, Jap. Will make a magnificent specimen.
Mrs. J. R. Trantor, white, Jap.
Golden Age, first class.
Yellow Miller.

VARIETIES FOR LARGE SPECIMEN PLANTS AND STANDARDS

The necessary characteristics for any variety to make a satisfactory large specimen plant are, strong, vigorous growth; good, healthy, and reasonably heavy foliage; stiff stems, and moderately dwarf habit.

A. J. Balfour, bright rosy pink, Jap. Makes a beautiful plant.
Col. D. Appleton, yellow, Jap. inc. Grows a trifle tall, but by stopping late may be shaped into a good plant.
Dr. Enguehard, pink, Jap. inc.
Garza, white, An. Can be grown to make a splendid plant.
Glory of the Pacific, light pink, early, Jap.
Ivory, white, Jap. inc. One of the very best varieties for the purpose.
Lady Lydia, white, Jap. Makes a fine plant or standard.
Louis Boehmer, pink, inc., hairy.
Miss Alice Byron, white. Rather tall, but will make a good plant.
Miss Clay Frick, white; sport from William Duckham
Mrs. H. Weeks, white, Jap. inc. Tall-growing, but can be worked into a magnificent bush or standard.
Polly Rose, white, sport from Glory of the Pacific.
R. Hooper Pearson, yellow, Jap. inc. The foliage of this variety is not quite as heavy as desirable, but the colour is superb.
Soleil d' Octobre (Oct. Sunshine), yellow, ref., early.
Viviand-Morel, pink. Makes a beautiful plant.
W. H. Lincoln, yellow, Jap. This is probably superior to any other variety for the purpose.

Brutus, orange bronze, Jap. ref.
Annie Laurie, dark purplish cerise. Makes a magnificent specimen.

VARIETIES FOR SINGLE-STEM PLANTS IN SIX-INCH POTS

These have been selected for both exhibition and decorative purposes because of reasonably dwarf habit of growth, good foliage, large blooms of fine form, and a good variety of colour.

WHITE
Beatrice May. A magnificent Jap. inc.
Merza, Jap. inc.
Miss Alice Byron, Jap. inc.
Miss Clay Frick, Jap. inc.
Miss May Seddon, Jap. Should be propagated early.
Mrs. H. Weeks, Jap. inc. Magnificent blooms from crown buds.
Polly Rose, Jap. early.
October Frost, Jap., early. (Smith's Advance.)

PINK
A. J. Balfour, Jap.
Amorita, Jap. inc. early.
F. A. Cobbold, Jap. ref.
Miriam Hankey, Jap. inc. New and promising.
Morton F. Plant, Jap. ref.
Mrs. Perrin, Jap. inc.
William Duckham, Jap. inc.
Glory of the Pacific.

YELLOW
Buttercup, inc.
Col. D. Appleton, Jap. inc.
Cheltoni, Jap.
F. S. Vallis, Jap. ref.
Monrovia, Jap. Early.
Maj. Bonnaffon, inc.
Merstham Yellow, Jap. ref.
Mrs. W. Duckham, Jap. ref.
Sunburst, Jap. inc.

OTHER COLOURS
G. J. Brooks, Jap. inc., purple crimson, silver purple reverse.
J. H. Doyle, Jap. ref., terra cotta red.

John Shrimpton, ref., crimson. An old variety, fine when well grown.
Merstham, red, Jap. ref.
Mrs. J. E. Dunne, Jap. ref., rosy terra cotta.
Mrs. Henry Partridge, Jap. inc., crimson, old gold reverse.
Mrs. George Heaume, Jap. ref., salmon bronze.
Mrs. D. Willis James, Jap., chestnut red.
Millicent Richardson, Jap. ref., rich purple claret.
Old Gold, Jap.
Winifred, salmon yellow, Jap. inc.
G. W. Pook, salmon terra cotta, Jap. inc.
Leslie Morrison, rosy crimson, Jap. inc.
Mrs. O. H. Kahn, bronze. A splendid variety, Jap. inc.
Pockett's Crimson, Jap. ref.
Charles H. Totty, chestnut scarlet, Jap. ref.

VARIETIES FOR GROWING IN SIX- OR EIGHT-INCH POTS, WITH THREE TO SIX FLOWERS, FOR USE IN PLANT DECORATIONS

WHITE
Clementine Touset.
Miss Alice Byron.
Mrs. W. H. Weeks.
Mrs. Nathan Smith
October Frost.
Polly Rose.

PINK
Amorita.
A. J. Balfour.
Helen Bloodgood.
Leila Filkins.
Mrs. Perrin.
Mrs. Coombs.
Rosiere.

YELLOW
Golden Age.
Golden Wedding.
Maj. Bonnaffon.
Monrovia.
R. Hooper Pearson.
Soleil d'Octobre.

CRIMSON AND RED
John Shrimpton.
Merstham Crimson.
Pockett's Crimson

VARIETIES FOR EXHIBITION CUT BLOOMS

These are all varieties that have appeared more or less prominently at the exhibitions

within the past two or three years. There are other varieties that can be grown to creditable exhibition quality, but few if any will prove superior to the varieties specified in their respective colours, or in open classes. They possess, when properly developed, qualities of size, substance, colour, stem, and foliage to place them among the winning exhibits.

Alice Lemon, soft pink.
Beatrice May, white, Jap. inc. A massive bloom, when grown from crown bud, which may be taken as early as August 15th.
Col. D. Appleton, yellow, Jap. inc. Massive blooms from crown buds. Lack of gracefulness is its only fault.
Yellow sport from Mrs. J. A. Miller, light yellow.
Chrysanthemiste Montigny, lemon yellow, Jap. inc. Another variety that will produce enormous blooms if early crown buds are taken. Propagate early.
Mrs. O. H. Kahn, bronze, Jap. inc. A splendid variety.
Cheltoni, yellow, sport from Nellie Pockett, Jap.
Pockett's Crimson, Jap. ref. New and best of its class.
Charles H. Totty, chestnut scarlet, Jap. ref.
F. S. Vallis, yellow, Jap. ref. Massive bloom, but weak stem.
G. W. Pook, salmon terra-cotta, Jap. inc.
Winifred, salmon terra-cotta, Jap. inc.
Golden Dome, yellow, inc. Sport from T. Eaton.
Howard Gould, bright chestnut, golden reverse, Jap.
Lady Hopetoun, pink, Jap.
Mrs. David Syme, pure white, Jap. Probably the best white ever introduced,
Mrs. A. R. Peacock, white, Jap. inc.
Miss Alice Finch, purple crimson, Jap. inc.
Merza, white, Jap. inc. Large bloom and good foliage. Stem is not quite first class.
Mary Mason, bronzy red, Jap.
Miss May Seddon, white, Jap. ref. Propagate early.
Miss Miriam Hankey, beautiful pink, Jap. inc., hairy. One of the most promising of recent introductions.
Morton F. Plant, deep pink. Jap. ref. Magnificent stem and foliage, but the flower sits a trifle too close to the foliage.

Mrs. George Heaume, salmon bronze, Jap.
Mrs. George Hunt, canary yellow, Jap. inc. Enormous blooms.
Mrs. Henry Barnes, old rose, Jap. inc. New.
Mrs. H. Weeks, purest white, Jap. inc. Magnificent in every particular when well grown. Difficult to keep, as it is very susceptible to damping.
Mrs. A. T. Miller, white, Jap.
Mrs. J. A. Miller, brick red, Jap. ref.
Mrs. John E. Dunne, rosy terra cotta. ref. A splendid grower and massive blooms.
Armanda, creamy white. Enormous Jap.
Pockett's Crimson, old gold, reverse, Jap. inc.
President Roosevelt, white, with pink striping to each petal, giving a light flesh pink effect, Jap. inc. An attractive flower.
Timothy Eaton, white, Jap. inc. A massive but coarse bloom.
T. Richardson, soft shell pink, Jap.
Valerie Greenham, bright pink, Jap. ref.
William Duckham, silvery pink, Jap. inc. One of the very best varieties.
W. Woodmason, crimson, Jap. ref.
Well's Late Pink, Jap. ref.
William Turner, white, Jap.
Yellow Eaton, Jap. inc. Sport from Timothy Eaton.
S. A. Necceur-Bey, bronzy yellow, Jap. inc.

VARIETIES FOR GROWING FOR COMMERCIAL CUT FLOWERS

The following selection includes most of the best known and most popular varieties for the purpose. It would be unwise for any one to grow more than one or two of the specified varieties of each colour of the early, mid-season, and late varieties.

Some varieties are better adapted to certain treatment than others, and some markets demand different varieties from others.

The grower can select the one or two varieties best suited to his conditions and needs.

EARLY WHITE

Clementine Touset.
Ivory.
Beatrice May.
Madam Gastillier.
October Frost.
Oroba.
Virginia Poehlman.
Polly Rose.

EARLY YELLOW

Carrie.
Comoleta.
Soleil d' Octobre.
Donatella.
Monrovia. A standard variety.
Golden Glow.

EARLY PINK

Amorita.
Glory of the Pacific.
Mrs. Coombs.
Mrs. William Wincott.
Mme. L. H. Cochet.
Pink Queen.
Unaka.
Rosiere.

MID-SEASON WHITE

Beatrice May.
Miss Alice Byron.
Miss Clay Frick.
President Taft.

MID-SEASON PINK

A. J. Balfour.
Dr. Enguehard.
Miss Miriam Hankey.
Morton F. Plant.
William Duckham.
Mrs. Perrin.

MID-SEASON YELLOW

Col. D. Appleton.
Golden Age.
Golden Wedding.
Major Bonnaffon.
R. F. Felton.
Sunburst.

LATE WHITE

Jeanne Nonin.
Mlle. Anna Debono.
Merry Christmas.
Mrs. Jerome Jones.
Timothy Eaton.
William H. Chadwick.
Chadwick, Improved.
Yanoma.

LATE PINK

John Burton.
Lavender Queen.
Maud Dean
W. T. Brock, Jap. inc.
Miss Helen Frick.
Mlle. Jeanne Rosette.
Superba.

LATE YELLOW

Golden William H. Chadwick.
Golden Dome.
Mrs. E. Beuttner.
Mrs. George Beech.
Nagoya.

There is but little demand commercially for chrysanthemums other than white and the various shades of pink and yellow. Some

crimsons and reds may be demanded, however; therefore a selection of a few varieties is given:

John Shrimpton, crimson.
Merstham, crimson.
Pockett's Crimson.
Intensity, red.
Goachers, crimson.
Matchless, red

HAIRY VARIETIES

F. J. Taggart, yellow, one of the best.
L'Enfant des Deux Mondes, white. Sport from Louis Boehmer.
Locadie Gentils, yellow. Sport from L'Enfant des Deux Mondes.
Louis Boehmer, magenta pink.
Pluma, delicate pink.

ANEMONE VARIETIES

Descartes, crimson red. Dwarf.
Enterprise, light rose, yellow centre.
Eulalie, white, good.
Garza, white. Splendid for bush plants.
Mrs. Hugh Gardner, deep rose.
Zoraida, white rays, yellow centre. Large and fine.
Beatrice Asmus, white. Small flower, but a pleasing form.

EARLY LARGE-FLOWERING VARIETIES FOR OUTDOORS

List of kinds recommended by the amateur whose experiences are quoted at length in Chapter I.

Any of the following early-flowering varieties may be expected to do well. I would always include Glory of the Pacific, and its sports, Cremo and Polly Rose.

DWARF

Cremo, light yellow.
Glory of the Pacific, pink.
Ivory, white, globular.
Lady Harriet, deep pink, incurved.
Pink Ivory, pink sport from Ivory.
Polly Rose, white.

MEDIUM

George W. Childs, crimson.
Lady Fitzwygram, white.
Marion Henderson, yellow.
Merry Monarch, white.
Monrovia, bright yellow.
Yellow Fitzwygram.

TALL

Soleil d'Octobre, yellow. The tall varieties are not well adapted to outdoor cultivation.

If the plants are to be grown for just one flower it should be so stated when buying, as otherwise you may receive plants with the tops nipped out, causing the plant to branch and form a bush. If you want to try any not named above, be sure to ask for *early*, large-flowering varieties.

THE END

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THE COUNTRY LIFE PRESS
GARDEN CITY, N. Y.